Digital Digest

Vol. 4 No. 1 **Devoted to Amateur Radio - Digital Communications & Technology** January/February, 1991

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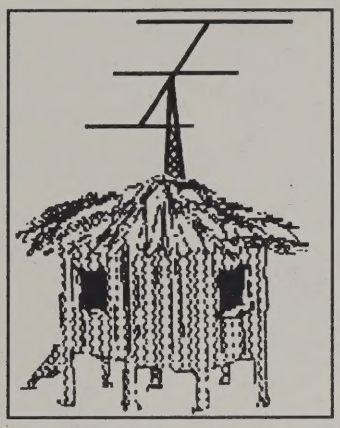

From The Publisher's Shack

If 1990 came in like a lamb, it certainly went out like a lion. Ham radio has seen the introduction of a no-code license agreement and the world becomes embroiled in full-scale war in the Middle East.

I've heard several reports that all-band radio sales have been way up, presumably due to the "trouble" in the Middle East. Perhaps there will be some positive effects for ham radio from the combned effects of increased short wave interest and elimination of the Morse code requirement.

Suppose I could even blame the Middle East situation as the reason this issue is latter than usual. Seems several of our writers have had one finger on the keyboard and monitor and another tuning to news out of the Gulf. I would probably be pretty safe to assume that many of us have had a similar affliction since January 15th.

The current state-of-the-art satellite communications and computer technology has brought live telecast of the sights and sounds of war into our living rooms like never before. A few days ago, I caught the tail end of a broadcast from Peter Jennings of ABC news where he commented something to the effect that this could be the first war recognizing the computer chip for meritorious service. His comments were apparently inspired by the success of the Patriot missile in knocking down the SCUD's (it wasn't that long ago that most of us never even new what a SCUD was) prior to impact. Upon hearing the comments, my first thoughts were of how "nice" a war it would be if the only sacrifices and losses in modern warfare could be relegated to a few fried computer chips. Unfortunately, at this writing, I don't believe that our technology has achieved that status.

In other matters, you may or may not have noticed that we have gone to a half-point smaller in type size. This is to accommodate more information and at the same time still maintain reasonable legibility for most readers. This move was partly inspired by the advent of new (and higher) postal rates which take effect in February. We plan to try to maintain our subscription rate as is by cutting down on our bulk rate through weight reduction of the publication if possible. We will see how well these efforts pay off in the next few issues.

(cont'd on page 23)

Digital Digest

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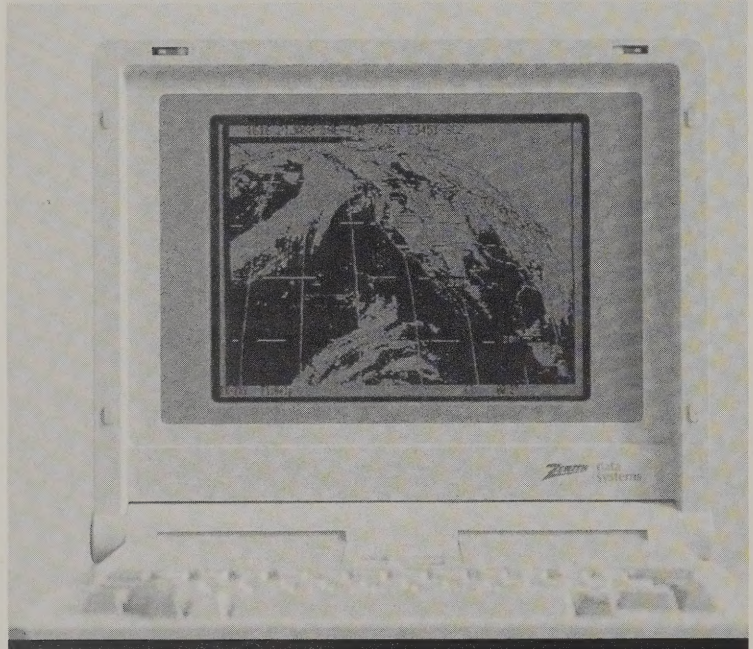

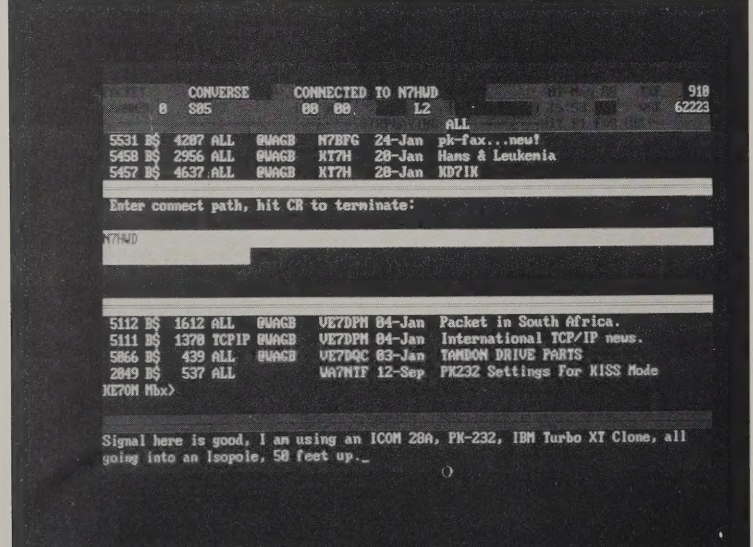
CONVERSE
CONNECTED TO N7HWD
Enter connect path, hit CR to terminate:
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FCC Creates Codeless Class of Amateur Radio License...

For the first time ever, starting in February, it will be possible to obtain an Amateur Radio license in the United States without passing a Morse code test. The Federal Communications Commission (FCC) has eliminated the need for new Technician class Amateur Radio license applicants to demonstrate proficiency in Morse code in order to have all amateur privileges above 39 MHz. The implementation date may be as early as February 1991. Technicians who obtain their licenses prior to that date will be grandfathered, meaning their existing HF privileges will continue.

The codeless Technician written examination will have 55 questions. New Technicians wishing to gain access to the HF privileges below 30 MHz now enjoyed by Novices and Technicians will be required to pass a 5 WPM Morse code test before three Volunteer Examiners accredited by Volunteer Examiner Coordinators, and will be given a Certificate of Successful Completion of Examination (CSCE) to serve as evidence of their qualifications. There will be no call sign designator to indicate Technicians who have or have note passed a code test.

The FCC took this action in response to numerous petitions and public comments. By offering a codeless class of license with privileges exclusively above 30 MHz, an entry level license will become available to those who fine the Morse code a barrier to becoming an amateur radio licensee. The FCC decided to retain the current Novice Class operator license as an alternate entry level license for those persons able to pass the 5 WPM Morse code test instead of the more comprehensive written exam required for the Technician Class license. No changes in Novice examinations or privileges were announced.

At a press briefing held just after the Commission's meeting, FCC Private Radio Bureau Chief Ralph Haller said,"The Amateur Service is not growing as it should relative to what it has to offer." He said the Amateur Service is where our nation's technical expertise comes from--that the changes should attract people who are in interested in computers and digital communications, and should help the U.S. to be more competitive.

February 1991 QST will carry more details. (ARRL press release dated: 12/13/90.)

Source: W5YI Report

HAM STUFF Is Coming!...

Ham Stuff is a soft cover book designed to become a valuable reference tool for anyone interested in ham radio, personal communications and electronics. Organized chapter by chapter, Ham Stuff will include listings of radio gear, antennas, power supplies, audio accessories, QSL cards, electronic parts, test equipment, repair services, books, magazines, newsletters, study tapes and other services needed by radio amateurs and electronic hobbyists. Tentatively, Ham Stuff will also include information on amateur radio conventions, major hamfests, honor awards and scholarships available to radio amateurs. All this information will be contained in a single reference volume updated regularly. For more information about Ham Stuff, address inquiries to Walt Garrett, NOMAL, GAI Systems Press, P.O. Box 5832, St. Louis, MO 63134.

Source: WESTLINK Report January 4, 1991

Five to Fly SAREX 91...

On the next scientific shuttle mission,STS-37, there will be five licensed amateur operators aboard;all members of the shuttle crew for this flight are hams! They are: Ken Cameron (KB5AWP),Jay Apt (N5QWL), Lynda Godwin (N5RAX), Steve Nagel (N5RAW), and Jerry Ross. Ross recently passed his Novice exam but as of this writing has not yet received his call.

The SAREX 91 mission, currently scheduled to fly in early to mid April, will have an upgraded station. In addition to FM voice, FM packet and SSTV, the SAREX package may include a one-way fast-scan amateur television system. This will permit ATV enthusiasts to uplink their ham station pictures to this flying amateur radio convention in space. Tnx SAREX Working Group via ANS.

Source: WESTLINK Report January 4, 1991

ICOM America...

has a new video entitled "More Than RAdios" which was created and produced by Zman Productions. Zman Productions is owned by Chuck/KE7SA and Dixie/N7OYY Zappala of Bothell, WA. The 28 minute video (VHS format) highlights the importance of bringing others into the hobby. It sends a special message to all amateur operators in a very unique way. The video is set in various towns throughout Washington state. A limited number of tapes are available from: ICOM America, Inc., 2380 116th Avenue N.E., Bellevue, WA 98004, and must be ordered on your ham club letterhead.

Source: W5YI Report

No Code Comments from the Public...

Approximately seventy percent of the more than 1,110 comments received from the public favored some sort of entry level codeless class. Some of these comments suggested alternatives that would have had undesirable effects on current licensees, the volunteer testing community, the FCC's workload - or went beyond establishing a single codeless class. The FCC said the remaining thirty percent objected to any form of codeless license.

Among those confirming the need for a codeless class is the Quarter Century Wireless Associations. "...many QCWA members have a lifetime history of operating with and a sentimental attachment to, use of the Morse code. It is understandable that some may not be overly enthusiastic in endorsing changes in licensing procedures which would delete the requirement of proficiency in this traditional mode of communication. Nonetheless, after consideration of the facts associated with licensing trends, we have concluded that the blanket code proficiency requirement may be a major cause of decline in the entry of many people into the Amateur Radio Service. Given this conclusion and in recognition of our responsibility to the Public interest, we are agreed that a blanket Morse code requirement for entry into the Amateur Radio Service can no longer be justified."

The American Radio Relay League agreed "...the FCC objectives in this proceeding are basically sound and are consistent with its own rationale for the creation of a codeless class. An ARRL study committee has concluded that the perception of the Morse telegraphy requirement filtered out too many desirable and technically qualified operators who have not recognized the value of manual telegraphy as a means of practical communication."

The National Conference of Volunteer Examiner Coordinators (NCVEC) stated that it "...found ample evidence that the Morse telegraphy requirement is no longer essential to an entry level amateur operator license." The Amateur Radio Industry Group (ARIG), another codeless class supporter, commented "...amateur radio has evolved from a hobby of tinkerers and telegraphers into a service of communicators... The Morse code requirement at the entry level is a carryover from the origins of amateur radio which today may be preventing many interested and otherwise qualified persons from entering the Amateur Radio Service."

Value of the Morse Code

There were also opposing views. Some said that telegraphy skill is absolutely required for

(cont'd on page 13)

by Lynn W. Taylor, WB6UUT
463 Myrtle Street • Laguna Beach, CA 92651

The State Of Packet Radio

The State of Packet Radio

For the past issues I've been keeping pretty much to one topic, and usually fairly close to some technical aspects of Packet. This time I'm going to diverge a bit, and ramble on about a number of subjects.

Before I get too far afield, these comments are based on my experience as a digital amateur going back to the late 1970's, mostly on VHF packet, with a little Baudot teletype and some recent AMTOR stuff thrown in. Some of these ideas are probably counter to the current conventional "wisdom."

The state of the network:

Last year I stated with some hope that 9600 baud is coming soon, and 1991 sees us still waiting, but things are looking up.

I received some information from Phil Anderson, W0XI about projects at Kantronics. You've read about the Data Engine, and in some ways it matches the "dream TNC" that I've had in the back of my head but never written about: the TNC itself comes without modems, and the modems are on modular plug-ins. Want a dual-port 9600 baud node? Just buy two DE9600 modems and you're almost there!

More good news is the "open architecture" of the Data Engine, it uses a NEC V-40 and has lots of room for RAM and ROM. Since the V-40 is very similar to the Intel iapx86 family processors in the typical MS-DOS machine, it's pretty easy to develop for this platform.

I'm also encouraged by new DSP TNCs due out from AEA and available now from L.L. Grace. The use of digital signal processing promises the ability to make a unit with an optimum modem for every single mode.

Unfortunately, I'm concerned about the high speed aspects of both DSP units -- the TNC will do fine at 9600 baud, but what about RF gear? Kantronics has the lead here with their DVR 2-2 and 4-2 radios, and I've seen hints of gear for 19200.

Where possible, we need to start adopting high-speed technology. More about that in a bit.

Host mode:

I am a host mode fanatic, and AEA has the lead here currently. Host mode makes it possible to write software that really "sings." An encouraging development is a host mode for the Kantronics TNCs. I'm sure I'll be commenting about the Kantronics host mode as I work with it. Stay tuned. Better yet, drop me a note.

I've not written much about software simply because, as the author of Packet-PLUS and Packet-GOLD, I know I'm biased. I do know what is possible with a good host mode.

AMTOR anyone?

Yeah, I know, this is the packet column, but I wonder how many of you out there are running units like the PK-232, and have never been on anything but packet?

Because Packet-GOLD supports more than just packet, I've been spending some time on AMTOR, and talking to folks about other modes just to get a feel of things again.

Back in the years "B.P." (before packet), I was a heavy RTTYer, not just from running "real" teletype machines (sure, computers are the way to really operate, but there is something magical about a 28KSR clunking away). One thing I miss is the "musical" sound of Baudot teletype. One thing I don't miss is having to wait for whoever is on to finish so I can get to the BBS, particularly if they are slow typists!

The other modes are not dead! In particular, AMTOR is probably the best mode for QSO-type operation on HF, and particularly if you can't put up a decent antenna in your area.

As I talk to these folks, I hear about working halfway around the world on 15 meters or thereabouts with only 5 watts.

If you want to get your feet wet and your buddy has a multi-mode unit, just set up your TNC for wide shift, and run open squelch. You can start out with FEC (mode B) and move on to ARQ mode. Most VHF rigs don't have fast enough squelch circuits for ARQ.

Back in my RTTY days, everything was 45 baud Baudot. WA4EGT and I were playing and managed to push Baudot through at 600 baud! Between the speed and the fact that it only takes 5 bits per character, things really flew.

One thing for sure, if you can push the data rate way up on Baudot or ASCII teletype, you know that your receive and transmit levels are the best they can be for packet, there is no error correction to mask errors here. Packet (and AMTOR) are sometimes too forgiving.

Data Compression:

Fast Baudot teletype is an eye-opener, partially because you can get the same message through with a lot less bits. Of course, it's all upper case, and you don't get nearly as many punctuation marks.

What it does remind me, though, is that there is a tremendous amount of text floating around out there, and of the 256 possible bit combinations, most of us rarely use more than 96. Isn't it time to think about compressing data, if not user to user, at least for the forwarded mail?

If anyone is interested in discussing compression standards, I'm interested in hearing your thoughts.

Software:

Network sofware is still pretty much where it has been, with one or two notable exceptions.

The G8BPQ software implementation of the NET/ROM protocol has been ported by the author to the Data Engine. In addition, since it also implements a "multi-drop KISS" protocol, you can have more than two ports by hooking additional TNCs to the Data Engine serial port.

Of course the G8BPQ software allows most BBS systems to also provide network services. Note that this makes it easy to move the BBSes off of the user channels entirely, and off perhaps to the high-speed backbones.

I've heard rumors about the latest ROSE firmware, but haven't seen it running. There are some interesting ideas built-in to ROSE, and I've heard that it's now the "hot ticket" in some parts of Florida.

I'd be interested in hearing what is going on in your area.

The cellular concept:

The advent of cellular telephones brings an important concept which has gone unnoticed by many in packet networking: put up alot of low-level sites, and keep re-using the channels as you move from area to area.

As more and more people enter packet radio (and I expect alot of no-code technicians to show up on packet), we can really INCREASE the network by DECREASING coverage. Think about it.

Splintering the network:

I've got this picture of how packet is used: Keyboard to keyboard users: folks who simply want to get on and talk, and packet is just one

more way to do that. These guys fall into two sub-categories: the ordinary "get on and talk" kind of guy, and the small group that all get on together and talk to each other.

A recent correspondent on CompuServe replied with some surprize when I suggested watching for folks to disconnect from a BBS and then connect to them: "I thought keyboard-to-keyboard operators were supposed to stay off of the BBS channels."

It wouldn't surprize me to find that there is a large majority out there that has never connected to a BBS.

BBS users: I've often been told that you can't find anyone to talk to on packet, all you can do is leave messages and read mail on BBSes. I'm sure that many think that this is the majority, and it certainly is vocal: remember however that there are thousands of BBSes out there, and a message to ALL@ALLUS will show up on each and every one.

DX spotters: these folks are a bit of an enigma to me, since many are on packet for one reason, and one only, to get DX information. The problem that packet in general needs to deal with here is that, unlike the rest of us, packet is a means to an end, not an end in and of itself.

TCP/IP evangelists: I'll admit up front, I am not a TCP/IP fan. For me, it seems a step backwards to require everyone to have a number in addition to their call as a network address, and I don't see much for the general amateur in TCP/IP -- besides, I have what I think is the perfect software package already.

A recent correspondent on the BBS network reports that TCP/IP and high data rates are thoroughly intertwined without taking into account that most of the folks he talks to are running TCP/IP.

My overall comment is this: just as amateur radio is fragmented into dozens of different areas, VHF, HF, FM, SSB, CW, ATV, AMTOR, Packet, etc., Packet radio is also fragmented, and many of the fragments are trying to promote their vision as the only solution. There is more than one right answer to practically every question on software and network design.

Courtesy:

A couple of issues back I ran an article on Packet Radio etiquette, and I want to re-visit one of the issues from that article.

I've been watching a debate over two divergent views of the future, and the technical issues in this exchange of messages have been clouded by personal attacks on the individual correspondents.

Me, I've always enjoyed a good argument, and have been known to start technical arguments just to see what comes out of it, but when one of the parties leaves the technical arena and starts insulting the other party, it can only mean one of two things: 1) he doesn't have a good answer to a question, so it's time to cloud the issues or 2) the person is not very good at expressing himself.

Here's the rub: for some bizarre reason, the electronic message services (and Packet BBSes are not the only ones with this problem) have a tremendous "immediacy" -- you read messages and somehow are compelled to respond immediately.

Next time you feel compelled to respond to a message that is more than just a friendly note, relax. Sit down at your word processor and compose your response, then wait. Pick it up later, and read it again. If your writing is loaded with emotion and short of carefully reasoned facts, the odds are your readers can tell. No one cares if you wait 24 hours to answer, and the result will make you look much better.

Parting shots:

I've covered a fair amount of ground this time, and the opinions expressed are my own closely held beliefs.

I'd be interested in hearing from you: do you agree or disagree? Are you brave enough to try cranking your PERSIST down, or your FRACK up? Did it help in your network. Do you think TCP/IP is the best thing ever, or that DX spotting is the only legitimate use for Packet Radio? What about traffic handling? I don't handle traffic, but I know it's out there. How can we survey the masses and really find out what the TNC owners out there are doing with their TNCs? How many haven't been turned off for months (and how many haven't been turned on)?

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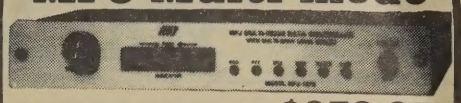

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What's New!?

What's new in packet radio? In Baudot RTTY? In AMTOR?

Well there's not much new in these modes these days, so let's go backwards a step in time to see what's OLD!

Old stuff is "formatting". It's one of my favorite "bugaboo" topics. I've discussed it in an earlier issue of Digital Digest. Formatting is a subject that everyone seems to prefer to ignore. That makes it eminently well qualified for an attack here in the "JUP" columns.

Before we begin to actually look at and discuss some of the format questions, let's take a gander at the philosophy of what we're doing.

Most of our ideas on formatting message texts come from the habits we've acquired as we read letters and printed matter, and as we've prepared texts in "human" modes. We're both trained and habituated in using specific formats in letters and other formally-prepared documents. Some of what we actually do in formatting letters is useful in amateur radio.

But, a large part of the formatting rules simply don't apply to messages and other prepared texts intended to be sent using any radio medium. When using any computer program that drives or controls a radio data controller, we depend on the data controller to take the computer-generated ASCII characters we actually type, and translate them into the "language" and form we need sent to the radio.

MORSE CODE

Let's consider Morse code. It really doesn't matter HOW we type the message or information if the output result is Morse code. Morse lends itself easily to complete variance in the character stream. No matter what you type or how you type it, if the receiving station is copying by ear, then there's nothing to be formatted. If, on the other hand, the receiving station is copying with some form of electronic data detector or controller, then typically that device will put out its own specification of data characters.

Consider this: Morse code itself doesn't have any questions of upper or lower case, or discreet spaces, carriage returns, line feeds, paragraph separations, etc. Your data controller may contribute some format effectors to the received data stream, but that's strictly between you and the controller and the controller's designers. It really has nothing to do with what goes out over the air as a direct result of you're having typed some characters. Nobody has ever sent a CARRIAGE RETURN and LINE FEED in Morse code.

BAUDOT/MURRAY CODE

Let's look at the original Baudot/Murray code, or International Telegraph Alphabet Number 2. This is the code that's called out in FCC's Part 97, under the section addressing "RTTY". This is what we're supposed to be using on the amateur bands.

The FCC's rules clarify that the so-called "RTTY code" produced by the average American teleprinters is not exactly what the FCC had in mind. These machines, such as the famous Teletype Corporation's Model 15, Model 19, Model 28, Model 32, (are there still really a lot of them around??) generally use the five-level Western Union code, or the American military code, or the U.S. Weather Bureau code, or the FAA variant code.

But unless you're dealing with a genuine telex machine (a teleprinter from the international telex network), you're NOT compliant with the rules. The standard Teletype Corporation machines almost always use the FIGURES case of letters F, G and H as some readily printable characters, which doesn't comply with Part 97. Judging from what I see on the amateur bands, though, the majority of active RTTY operators don't seem to care much about this issue.

Let's take a look at the FCC's Part 97.309, titled "RTTY and data emission codes"

(a) Where authorized by 97.305(c) and 97.307(f) of this Part, an amateur station may transmit a RTTY or data emission using the following specified digital codes:

(1) The 5-unit, start-stop, International Telegraph Alphabet No. 2 code, defined in International Telegraph and telephone Consultative Committee Recommendation F.1, Division C.

If we now look at the CCITT's Recommendation F.1, we see that ITA #2 prohibits the transmission of the secondary characters FIGURES CASE of 'F', 'G' and 'H', which "are reserved for use in each country in accordance with determinations of that country's Administration". The exact wording for Note 2, referring to the secondaries of 'F', 'G' and 'H' goes like this:

"Available for the internal service of Administrations".

CCITT Recommendation S.4 states that these symbols should NOT be used on international circuits. They may appear as printable characters but the keyboard should not be capable of generating them. This means that each nation reserves the right to use FIGURES 'F', 'G' and 'H' as it best sees fit for its own languages.

For example, in Spanish-speaking nations, the FIGURES G is the ENYAY, "%" the upper-case N with the tilde over it. In Portuguese-speaking countries, the FIGURES H is the "", the C-CEDILLA, the upper-case C with the little squiggle under it. Each of these lands in which English is not spoken has its own internal standards, which are guaranteed to them under the terms of the ITU conventions. They can do whatever they please with FIGURES F, G and H as long as they stay within their own national boundaries.

In addition, in ITU #2, the DOLLAR SIGN ($) is also prohibited because FIGURES 'D' is the 'WRU' or international answerback command.

In ITA #2, the QUOTATION MARKS (") are actually the PLUS SIGN. Quotation marks are emulated traditionally by two apostrophes ('').

In other places, ITU #2 states that these FIGURES 'F', 'G' and 'H' are "prohibited in international telecommunications". Some of the modern data controllers actually send a question mark on the air when one enters one of these "prohibited" characters.

We have a few more conventions according to ITA #2:

- To indicate "WAIT", transmit the characters "MOM";
- To indicate a BLANK, transmit the signal "SPACE";
- To indicate ADDITION, transmit the cross sign (+)
- To indicate SUBTRACTION, transmit the dash (-);
- To indicate MULTIPLICATION, transmit the letter X;
- To indicate DIVISION, transmit the colon (:) or transmit the fraction bar (/);
- To indicate PERCENTAGE, transmit successively the figure 0, the fraction bar and the figure 0;
- To indicate QUOTATION MARKS, transmit the apostrophe twice ('');
- To indicate MINUTES and SECONDS, transmit the apostrophe sign
  once for the minute sign (')
  twice for the seconds sign ('');

Let's summarize the conventions of International Telegraph Alphabet #2. We've got to accept ITA #2 with the same calm and peace

that we've used before in amateur radio. It's kind of like coming of age. As long as the FCC clearly states that this is what we have to use, we can assume that the days when we all could bang away on our venerable Model 15s and Model 19s and Model 28s are simply gone and forgotten.

The fact is that I personally don't know anyone who's still actually using one of these old-fashioned electromechanical teleprinters. I'm sure these folks must be out there, but I just don't know of them. So much for ITA #2 and Baudot/Murray Code.

ASCII CODE

In ASCII, as far as the characters you type being sent to your radio, basically it's a "you get what you pay for" situation. Whatever ASCII characters you put in to the terminal unit is what comes out of your radio. That's the way it should be.

AMTOR CODES

In AMTOR, your data controller - if it obeys the FCC's rules - is a slave to the Recommendations of the CCIR, the International Consultative Committee on Radio. Here we're dealing with Recommendations 476 and 625, the main regulations that govern SITOR in the commercial maritime radio service.

For AMTOR, the FCC has simply adopted and quoted all of these CCIR Recommendations in its Part 97. Simple and direct. Probably saved the FCC a bundle of think-time. Again we're slaved to ITA #2 in all its glory. And that's really all there is to AMTOR.

FORMATING FOIBLES

Now back to formatting. Many of us "multi-moders" are presently enjoying the operation of some form of digital "interface" device such a PK-232 or a KAM or a MJF-1278. Perhaps some of us are using one of the HAL devices for Baudot/Murray code, ASCII and AMTOR. If not, then we're using some plain "packet-only" Terminal Node Controller. But no matter what we're using to generate our digital data words, we need to pay some attention to the ins and outs of exactly what our stuff LOOKS LIKE at the receiving end.

I wonder just how many of us have actually logged on to a packet BBS or an AMTOR APLINK system and READ OUR OWN MAIL?? You might just be a bit shocked if you do this!

I see three general "formatting" problems, especially in packet radio.

1. Problems created by the way the user actually types his or her original message;

2. Problems created by the program being run on the computer, and the methods and means of terminal emulation;

3. Problems created by the way that the data controller actually formats the typed data and sends that message.

All these data controllers that use internal "firmware" already contain the software routines needed to put the data characters in some form of logical, rational order and format. In most cases, the original factory default values are adequate. They've been arranged to produce a properly-formatted text message in the receiving system when used with a "standard" terminal program.

In those "dumb" terminal units or controllers that depend on external software, the problems arise from Steps 1 and 2 only. That may simplify things a bit -- we may need to attack only the typist!

In AEA's PK-232, there are a number of commands that affect the way that text is formatted. I discussed them in great detail in last year's July/August issue of Digital Digest, so I won't bore you with repeating them.

The net result of all of this formatting aggrevation is "wasted bandwidth". This is spectrum space that should be carrying data of some kind, but instead is being used to repeat and re-run data that can't be or hasn't been properly received, or data that is just plain unnecessary.

WASTING BANDWIDTH IN AMTOR

Let's look at some examples of "wasted bandwidth" in AMTOR. Here's the type of "CQ" call you can see on the bands any day.

RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR
CQ CQ CQ CQ CQ CQ CQ CQ DE W2JUP W2JUP W2JUP SELCAL WJUP WJUP WJUP
CQ CQ CQ CQ CQ CQ CQ CQ DE W2JUP W2JUP W2JUP SELCAL WJUP WJUP WJUP
CQ CQ CQ CQ CQ CQ CQ CQ DE W2JUP W2JUP W2JUP SELCAL WJUP WJUP WJUP
CQ CQ CQ CQ CQ CQ CQ CQ DE W2JUP W2JUP W2JUP SELCAL WJUP WJUP WJUP
...and so forth for five, six or more lines

What's wrong here? Lots of "wasted bandwidth" is what's wrong!
1. Sending "RY" in AMTOR is a TOTAL waste!

(cont'd on page 20)

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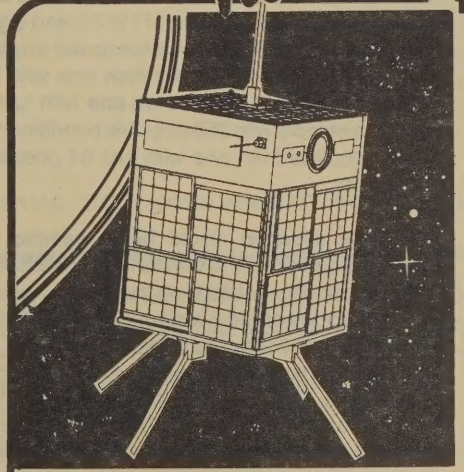

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by Jonathan L. Mayo, KR3T
3908 Short Hill Drive • Allentown, PA 18104

Digital Signal Processing

Column Premiere

Welcome to the beginning of a new column dedicated to exploring one of the latest frontiers in amateur radio technology - Digital Signal Processing. It is fitting that the Premiere of this column appears in the first Digital Digest of 1991. During 1991, thousands of amateur radio operators will be exposed to Digital Signal Processing technology for the first time, and by year's end, many hams will be using some form of Digital Signal Processing technology in their shacks.

Digital Signal Processing, often abbreviated DSP, has been around since the 1960s, but the recent development of specialized DSP integrated circuits has pushed the sophistication and practicality of DSP technology to new levels. The Motorola DSP56001 and the Texas Instruments TMS320C25 are two popular DSP chips. For a variety of reasons, DSP technology has been popping up in electronics equipment over the past year. Some landline modems now incorporate DSP, and Cincinnati Microwave's new Escort radar detector uses the Motorola DSP chip.

I'll discuss amateur radio DSP applications later in the article, but first I'd like to cover some of the basics of DSP technology.

Generic DSP Technology

DSP has many specific applications, but most DSP systems follow some basic concepts. In this section, I'll discuss these basic concepts to develop a fundamental understanding of DSP technology. Keep in mind that some specific DSP systems may expand on or narrow their capabilities with respect to the following explanations.

DSP technology centers around the processing of discrete time signals. A discrete time signal is a quantifiable value at a given time. A discrete time data sequence is generated when the values of many discrete time signals are gathered at set time intervals. There are many data sequences that are discrete in time intrinsically. For example, the number of cars parked in a specific lot at noon.

However, we live in an analog world. Most events in nature do not take place in precise intervals. Rather, events take place continuously over time. For example, the temperature does not change by one degree intervals. Rain does not fall in one inch increments. In the vast majority of cases, gathering a discrete time data sequence involves sampling.

Sampling is a very important concept in DSP. By sampling, we are able to convert analog, or continuous time signals, into discrete time signals. Sampling involves measuring an analog signal at a preset time interval. Through sampling a discrete time data sequence can be obtained from a continuously varying analog signal. The sampling rate (how often the analog signal is measured), along with sampling resolution, determines how accurately the discrete time data sequence reflects the original analog signal.

When the analog signal is sampled, the value of the signal at that specific time is quantized. In essence, the value is recorded in digital form. For example, when a person says "On a scale of 1 to 10, I rate it a 6." he is quantizing. The resolution of the quantizing determines how accurately the digital sample reflects the original analog signal. The greater the resolution, the greater the accuracy of the sample.

In DSP systems, the sample is most often represented by a binary code. The greater the number of bits, the more exact the sample can be. A single bit gives a sampling resolution of 1 in 2 since one bit can either be 0 or 1. Five bits gives a sampling resolution of 1 in 32, and eight bits yields 1 in 256. Just as a computer display with 256 colors looks better than one with 64 colors which looks better than one with just 8 colors, a sample with 256 possible conditions is more accurate than one with just 64 possible conditions.

The ideal situation would be to sample as quickly as possible and with as much resolution as possible. This would yield the most accurate reflection of the original analog signal. Unfortunately, we are limited by processing power to how fast and how exact sampling can be done. Additionally, if it was necessary to retain this quantized data sequence, copious amounts of data would have to be stored. Thus, there are limits to the sampling and quantizing processes.

What we've covered so far is only the beginning of Digital Signal Processing. Once the desired analog signal has been coverted to a discrete time data sequence, it is processed. How it is processed depends entirely on what the DSP system is designed to do. Some simple applications include filtering out "abnormal" variations in the analog signal, such as noise or interference. This can be done by excluding or modifying samples that don't meet a predetermined criteria. In fact, digital filters make up an important part of DSP technology.

DSP in Amateur Radio

While all DSP involves filtering in one way or another, current amateur radio applications of DSP can be divided into two camps: filtering systems and modems. The filtering systems can be external additions to transceivers or built-in. The DSP modems are the cornerstone of a new breed of multi mode digital communication interfaces.

Kenwood currently has two DSP filtering systems available. Their TS-950SD transceiver contains a built-in DSP filter system, and they also make the DSP-100, an add on DSP filter system for the TS-850S transceiver. These DSP filters are capable of providing "unsurpassed receive and transmit performance that is not possible with analog processing."

While the DSP filter systems are wonderful technological advances, most of the interest of Digital Digest readers is probably directed at the DSP multi mode digital communication interfaces. These devices will prove a significant advance in amateur radio digital communications. Their primary advantage is their ability to emulate most any modem standard.

Imagine being able to use one interface to communicate with a variety of modulation systems. Current multi mode interfaces such as the PK-232 and KAM contain two separate modem systems, one for HF and one for VHF. This allows them to operate the standard digital modes, but they are not capable of communicating with newly developed modulation standards without the use of an external modem. By having a DSP multi mode interface, the single DSP modem can be programmed to emulate most any modulation standard.

In fact, using DSP, it is very easy to "play around" with the modulation characteristics. You could develop your own standard or simply optimize the modem for a specific use. DSP allows a great deal of flexibility. It is no longer necessary to change modem headers or add a new external modem to alter an interface's modem characteristics. Using DSP technology, you can write your own modem in software; simply tell the DSP section what you want it to do.

There have been several announcements of DSP multi mode interfaces by amateur radio manufacturers. These include AEA, L.L. Grace, and TAPR/AMSAT. I'll be examining their products in future columns, but for now I'd like to

```
E>gce

*************************************************
* General Communications Executive (GCE)   0.10  *
*       00/00/00     00:00:00     DSP: Stopped     *
*------------------ Main Menu --------------------*
* (C) 1990 L.L Grace Communications Products Inc *
*************************************************
<A> Run Standard DSP & Terminal Programs
<B> Configuration Changes
<C> Debuggers



Enter your selection...a

     ** PACKET (Synchronous) MODEMS **
<AA>  300 bps Shift= 200hz, Mk=2110+    <AB> 300 bps Shift= 200hz, Mk=1600+
<AC>  300 bps Shift= 200hz, Mk=0980+    <AD> 300 bps Shift= 200hz, Mk=1650+
<AE>  300 bps Shift= 200hz, Mk=1070+    <AF> 300 bps Shift= 200hz, Mk=2025+
<AG> VHF   1200 bps Shift=1000hz, Mk=1200+
<AH> BPSK   400 bps Manchester (OSCAR-13 telemetry)
<AI> BPSK  1200 bps (MicroSats, FO-20)
<AJ> V.26B 2400 bps
<AK> K9NG  9600 Direct FSK

          ** FSK (Async) Modems (for RTTY,ASCII,AMTOR) **
     Enter these codes with the speed after the code, eg, BA110
          Valid Speeds: 45,50,57,75,100,110,150,200,300
<BA> Shift=170hz, Mk=2125+          <BB> Shift=170hz, Mk=1445+
<BC> Shift=170hz, Mk=1415+          <BD> Shift=170hz, Mk=1615+
<BE> Shift=170hz, Mk=1915+          <BF> Shift=425hz, Mk=2125+
<BG> Shift=850hz, Mk=1275+          <BH> Shift=850hz, Mk=2125+
<BI> Shift=85hz,  Mk=1657+

     ** Other Modems **
<CA> CW: 750hz +/-100hz

Enter modem# (or ZZ to leave DSP processor as is)...
```

"Display from L.L. Grace DSP-12 user interface Version 0.10 (July 1990) showing initial menu and variety of modem standards emulated with the Motorola DSP56001 Digital Signal Processing chip."

discuss the general features of these units so that you have an idea of what all the excitement is about.

AEA announced two DSP products at Dayton last year: the DSP-1232 and DSP-2232. The DSP-1232 and DSP-2232 are similar products; the DSP-1232 has two switchable radio ports while the DSP-2232 has two simultaneous radio ports. The modem sections are both capable of operating all standard HF digital modes, standard VHF packet, HAPN's 4800 bps standard, K9NG's 9600 bps standard, AEA's 2400 bps standard, and all Microsat and Oscar modem standards as well as WEFAX and SSTV. New modem standards can be added by a firmware update.

The AEA units operate like the AEA PK-232 with a similar command structure and user interface. The DSP-2232 can operate as a gateway with its simultaneous radio ports, and also features a two line LCD display. The DSP-1232 can be upgraded to include DSP-2232 features. The DSP-1232 will list for $798.00, and the DSP-2232 will list for $999.95. Both should be available in the immediate future.

The L.L. Grace unit, DSP-12, has been advertised in QST for the past several months. The DSP-12 uses a Motorola DSP56001 DSP processor and a V40 PC compatible processor. The DSP-12 presently supports over 40 modem standards for HF and VHF packet, RTTY, ASCII, and satellite. New standards can be added by a firmware update or downloaded into RAM. The DSP-12 sells for $595.00, and a one megabyte memory expansion is $149.00.

(cont'd on page 17)

by *Jim Mulvey, KS1A*
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25 Ways to Get More Out of Ham Radio!

What's the matter Bunky, got the mid-winter ham radio blues? Do you love hamming but you're in a rut? Temporarily tired of the same old thing? Well here's twenty-five suggestions to get cracking on! Twenty-five fun little projects to get the amateur blood flowing again.

1) MAKE A SHACK REFERENCE BOOK.
Get together a small looseleaf binder and include the countries list, beam headings, emergency numbers for police, fire, coast guard, MARS and ARES net frequencies for your area, net times and frequencies for the local 2-meter civil defense net that serves your area, sheriff department phone number, etc. Make a one-sheet on how to make and send a HAMGRAM. What's the format for a message and to whom do you hand it off to get it out? If the need arises to call the police for someone who needs assistance you'll need to act quickly. If someone asks you to send a routine HAMGRAM you'll want the information fast. Searching around for the proper format can make you lose interest in sending a routine HAMGRAM very quickly. Make yourself a simple primer on how to get it done. One page on each subject gets it done. My shack reference book contains more than formats and emergency numbers. I also have the VUCC map of grid squares (with the ones I've worked colored in), my DXCC list with all the boxes filled in for who I've worked and QSLed, the most interesting scanner frequencies for my area, my Worked All States lists for all bands, etc.

2) BECOME A TVI-RFI EXPERT.
Staring today, place in a manilla folder every article you come across on Television and Radio Frequency Interference. Look for the little paragraphs on how one ham cured the RFI into the neighbor's phone. Start banking a whole collection of cures and suggestions that people send in to the magazines. Include everything you can find on telephone RFI, Tvs, stereos, etc. You'll soon be very knowledgeable about TVI and how to suppress it. Make this a mission. The more articles you get the more you'll know about cures. Pay particular attention to articles on grounding. Learn what a torriod can do to stop a computer from generating noise into your rig. Learn what a good AC-line filter can do. You've heard all these terms before but how many people know how to use them? It's easy. Build your folder over time. Clean up your situation and then help friends. Clearly, this knowledge is learned over time and not by reading a single book. So start on this project the next time you find an article on RFI/TVI.

3) START A MONTHLY BREAKFAST WITH THREE OTHER HAM FRIENDS.
Do it on one Saturday morning a month and talk about it on the local machine. You'll most likely get a couple more who'll ask to come along. Do it every month, the same Saturday and after four months you'll have a tradition. And do these things build fast! A breakfast like this is the opposite of your formal ham club meeting. Here, people can bring their families, and leave for chores and family outings by themselves right after breakfast. They still have the weekend to do what they wish. Try three months worth, and watch it grow.

4) FILL IN A SHACK CALENDAR.
Get a big calendar with lots of room to write in the boxes. Go through the January issues of the ham mags and fill in all the upcoming contests, hamfests, operating events, etc. that you'd be interested in. With a calendar like this not only will you write the correct day in the log, but you'll be able to see at a glance what activities are coming up for the month. You'll be able to plan better, and you'll participate in more ham events.

5) WANT A CLASSY SHACK?
Look for radio related items to by when you're out shopping with the family. I mean items outside the rhelm of wire and rigs. If you find yourself at a craft show look for people selling old stock certificates from the 30's and 40's. Almost everytime I look I find "Edison" or "Radio Corporation of America" stock certificates at these shows. Take 'em home and frame them! They look sensational on the wall. I bought a beautiful Marconi Wireless company stock certificate, framed with a photo of the transmitter site on Cape Cod from AK1L in New Hampshire at such a show. Write him at the callbook address. Go to a stamp dealer and buy ten stamps related to Amateur Radio from around the world. Arrange them on a good looking textured piece of paper in a good frame and you have a very extensive looking item for your shack wall. I went to a stamp dealer and bought a whole sheet of the US Amateur Radio issue from the 60's and framed it. Looks great and I think the total cost was $1.90! The trick is not to thumbtack this stuff to the wall. Get a good frame and the result is magnificent!

6) HIDE YOUR WIRES.
Go to a hardware or electrical supply store and ask for gizmos to hide wires with. They sell lots: Tacks with tie-wraps attached so you can route wires under the desk top or down the desk leg. Makes for a very clean look. Radio shack sells holders that adhere to any surface while holding your wiring.

7) DO YOUR MATH AND BREATHE EASIER.
Take each piece of gear in your shack and find out how many watts of wall-AC it's using. Why? First, when you get all the figures you'll know if that wall socket is overloaded. Or, that your electrical wall circuit can take lots more gear and you've been worrying over nothing. You'll know if you're using the right gage extension cord or if you need to upgrade it for safety. And second, when you have the wattage figure go get your electric bill and look up what you pay in watt-hours. Figure out what running your gear actually costs in electricity. Everyone does know the math, right? To get the figure for what your gear uses in AC-wattage ("P"), you multiply the house current of 117 volts ("E") times the amperage the rig draws ("I"), which is right in your manuals. Simple!

8) GET ON PACKET.
If you're already there, great! If not, go get yourself a TNC!!! Your country totals will go up by a hundred band-countries on the DX spotting nets, you'll leave it on all the time to catch the announcement of that "rare one" you need! You'll check in to the bulletin boards and read the announcements and happenings of what's happening in your area. These days, "putting the word out on packet" is a must when you're planning anything. You'll get the word about serial numbers of recently stolen rigs to watch for, the latest news on the SAREX shuttle and AMSAT happenings, questions, answers to any of your queries, and much more!

9) PUT TOGETHER A PACKET BRIEFCASE.
Put your HT, along with a cheap used Tandy 100 or 102 terminal (or your laptop if you have $$) along with the Heathkit Pocket-Packet TNC and you're QRV from anywhere! Those folks who are innovative include a telescoping whip that comes right up out of the briefcase. Take it on business trips, mountain-topping and on vacation. Remember, your two watts is all that's needed to digipeat through one of the strong locals. Just leave everything set on 145.01 for a few minutes and you'll know who you can hit.

10) CLEAN OUT YOUR UNUSED STUFF.
and sell half of it. Need money to do the things I'm suggesting? Do a whole-house search for radio related items you really will never use and GET RID OF IT at a ham flea market. Here's what you do: On an index card write the words "YOU WILL NEVER EVER USE THIS. GIVE ME

A BREAK." Then when you walk around your basement thinking "Should I keep these four 1972 Glebrock Computer Cases and this spare HT from 1922?" read your card. Pack rats usually need a friend to make the decision for them. They'd die to have that new piece of gear yet they can't part with those twelve clunker-teletype machines in the garage. Usually they add, "What could I even get for the lot? A hundred bucks?" Well why not a hundred bucks? That's a hundred bucks closer to what you want to buy. And freeing up the garage from all that clutter makes you healthier and better looking.

11) MAKE A NEW QSL CARD.
Simple. Go to the local historical society and pick out a photo of your town. Or, take one yourself of a landmark. Want something original for little dollars? Contact the graphic arts department at the nearest college and contract a graphics student to make you an original red-hot QSL card. These kids are brilliant and jump at the chance to show what they can do. They usually charge almost nothing. (You should pay them something!) Or, make a simple card design with a desktop publishing program on your computer. Get a friend to hand scan an old drawing of a tower or whatever you'd like, and add it to your card. Then ask another friend to Laserprint the finished product. Bring the laser printed art to a Printing place. Explain that you want as heavy a stock as you desire and what colors to make your call sign, etc.

12) HOOK YOUR RIG UP TO YOUR COMPUTER
and see whathat ease it brings to contesting, logging, etc.

13) IF YOU HAVE A COMPUTER:
Get into computer logging! Some will prefer plain paper and that's fine! But I've found computer logging to be the cat's meow. (I keep a paper backup of the log, too.) But the computer lets me find out if I've worked VLAD before and what we last spoke about, who has and has not replied to my QSLs, prints all my QSL labels in a snap after a big contest, gives me instant beam headings and sunrises/sunsets, etc. You may do all of this by hand now. But the whole advantage of computer logging is that it takes the drudgery out of the chores. You don't have to do it by hand. I type in the callsign. The computer gets the freq, band, time and date automatically, shows me the beam heading, prints the qsl labels and stores the contact for lookup later. It does it very quickly.

14) EXPLORE THE HF BANDS.
Tune around and listen outside the ham bands between 2 and 30 MHz. On any night I can show you the elusive spy-number stations, the pirate broadcasters, the lonely CW markers from African, European, South American and Asia, the far flung airports and coastal stations, the unscrambled military traffic, the commercial airliners calling in their positions, and the wonderful entertainment provided by the programs of fine commercial broadcasters. There's more outside the ham bands than WWV!

15) MAKE A DATABASE OF ALL THE REPEATERS IN YOUR STATE
so you can sort by frequency and area. This is great for taking trips. But it's also fun at home. Once made, get on the air at the low end of the repeater band and drop your call. Copy down the ID's of repeaters that come on. If you have a beam you'll be amazed at the distances you can be heard Q5, as you travel up the band. Your list tells you where you are and what you're hitting. Another repeater project to try is to buy a commercial road map of your region, and pen in all the repeater sites. It's a great help to have when travelling, backpacking, etc.

16) MAKE CAR CABLES.
Get some heavy gage insulated wire and make a set of cables to power your shack's rig from your car battery. On one end will be a set of big clamps for the car battery. On the other will be your rig's twelve volt connector. Place a fuse in line, and you're all set for power outages and emergencies. This assumes you'll be bringing the car and the rig near each other when needed. Running extremely long cables from your car battery and down the driveway up to your shack in the house is not advised.

17) ELIMINATE THE UNCOMFORTABLE.
Eliminate the most uncomfortable part of your shack: is the room always too cold or hot? is the air stale? is the lighting poor? is your chair torturous? Fix it.

18) BECOME KNOWN FOR SOMETHING.
Not for ego. Rather, become the person who keeps track of when all the VE sessions are held. Someone who hams can call on for information because you're the guy/gal who knows. Or become the area TVI/RFI buster expert and gladly help out where you can. Be the Elmer who specifically councils computer beginners. How do you get known for your specialization? Just announce at the next club meeting that you're willing to help anyone with questions about your subject and mean it. Make the announcement again next meeting. Friends will tell friends.

19) BRING ONE NEWCOMER INTO THE AMATEUR SERVICE EVERY YEAR.
That is a realistic goal. Either introduce someone to the service or teach one session of your club's novice class. Put a free ad in the local paper's community announcements with your club's referral phone number. "Getting into ham radio is simple! Call the DEVO Amateur Radio Club at 555-hams and we'll show you." Believe me, there are people out there right this second who want to be hams and just don't know how to go about it. Imagine if they find you, what a positive influence you'll have on them. Just one new ham a year, that's all we ask.

20) MAKE A "QRZ CARD" AT WORK.
This only works if you're employed at a large company. Want to find out if there are other hams (active or inactive) at your company? On the employee bulletin board, place an index card and write in big letters: Q R Z ? with your extension number. Nothing else. No names or explanation. They'll call.

21) UPGRADE YOUR CW SPEED.
Set a goal of five to ten words per minute higher than you currently can copy, and become fluent at that higher speed. Learn to the level of almost no mistakes. I find three learning methods helpful. One is the W1AW code practice. Second is a wonderful shareware program available from any ham BBS called SUPERMORSE! (or, "SM113.EXE" where the 113 indicates the version number. This will change, it now may be "SM115" or so.) And third, is my "sign attack method". Have you ever seen the video game where aliens are coming at you fast, and you must shoot them before they reach you? I do this while driving. I must convert every highway sign of any kind coming at me into Morse code before it reaches me. By the way it's true that ten minutes practice every single day is the only way to do it. An hour once or twice a week doesn't work.

22) UPGRADE YOUR SHACK APPEARANCE.
This is one of my favorite things to do in ham radio. To me, improving the shack is relaxing and fun. Build some boxed shelves around your gear leaving an inch in all directions for ventilation. Buy 1/4 inch thick heavy glass for your table top to slip charts under. Buy car mount brackets and mount your scanners and smaller rigs under the lower shelf in front of you, etc. For a million more ideas, look through the ham mags for how people have their set ups.

23) UPGRADE YOUR COMPUTER.
If you can spare the cash at this time, add something good. We just replaced the old 10 MHz 286 with a 25 MHz 386 and a lightning fast disk drive. It flies.

24) BUILD A PORTABLE QRP STATION.
Articles abound on this. I paid $19 from RAMSEY ELECTRONICS in Victor, New York for a 2 watt 20 meter QRP kit. I mounted a key on top of the little chassis and use a video camera battery rated for 1200 milliamp hours at 13

(cont'd on page 21)

by Lacy McCall, AC4X
3001 Zelda Drive • Montgomery, AL 36106

Are You Ready?

"Yeah, but are you really ready?" Those words may be heard lot's of places each day. Sometimes they are more critical and at others it is just a nice way of saying "I'm ready." Perhaps, you have tuned by the religious channel on cable television and caught the phrase being shouted to a multitude, or maybe you said it yourself, just before backing out of the driveway and embarking on a long trip with the family. There may even be a few of you out there who have used those three little words as pillow talk, not too long after the lights were extinguished.

Yet, only when Hank Williams, Jr. bellows it, does the significance of the phrase make most warm blooded American men come to attention. There is a low roar in the bars across the land and electricity in the air in millions of living rooms as the anticipation builds. Personally, I use Hank's introduction to rouse me from the little doze I take early each Monday night; for without the nap, I could never make the second half.

Whoever decided that Hank and his retort to gather all the rowdy folk, would be a good introduction for Monday Night Football, should receive an all time award for genius; second only to the person who thought up Monday Night Football in the first place.

Significant events in this century and how they have affected each of us makes interesting conjecture when there is a little idle time to think. You would be hard pressed to think of anything more significant in changing the patterns of American life than the Monday night match-up. Even if you hate football, you must admit that bringing a little bit of weekend activity to the end of the first business day of each week was a brilliant idea. For one, I catch myself not minding Monday nearly as much, even if I am not ready!

RACE TO WHERE?

Now, to the more serious events that affect us, and that have a direct bearing on how we use radio. In the early 60's, John Kennedy launched us, as well as our space program. It happened as a way to restore our national pride in leadership, along with other reasons you and I may not know; but the result was amazing.

Our plunge into the race to put a man on the moon has given us all the technology that we find ourselves submerged in today. It may have come without the challenge, but with lightening speed the computer chip descended on society. The outcome is the tremendous base of technology and base of technical companies, engineers and scientists who have never slowed the pace. Surely they have thinned ranks from time to time as funding waned, but what started as a race, may be the crusade that ultimately keeps us in the position of world leadership we seek as a nation.

Almost every piece of amateur radio equipment you can buy today is a direct descendant of this technology. The digital dials, digital signal processing, computer control, new modes like packet, all are standard items today because of the direction of John Kennedy and the nation's desire for self esteem and a position of leadership. It was a good feeling then, and it is a boon now.

A significant event? You bet; one of the most, maybe even as significant as the Monday night game!

HOW SMALL CAN IT BE?

Miniaturization began because we could only lift so much weight into orbit. I can remember the first electronic calculator I bought which cost me nearly two thousand dollars. In fact, it was so expensive, I did not buy it, I leased it. It was as big as today's IBM electric typewriter. Each digit was an individual tube and to this day, I wish I had opened it up to see what was inside, but my bet is that the innards would have stocked a spare parts booth at a ham flea market.

It didn't take long until for ten bucks or less, I could get more power in a calculator about the size of a deck of cards. Someday, I would like to know just how many small electronic calculators we have consumed in this world in the last thirty years. Now the price is so low for solar power models, they are less costly than the batteries some still use for power; meaning completely disposable.

Many companies that supply amateur gear, particularly those who expect large volume sales like Icom and Kenwood, each year make strides in making the equipment more compact and smaller. Yet one of the most important items to many of us remains a "big box dinosaur." AEA's PK-232 is a wonderfully thought out and proven controller, and for my money the best around, yet why can't AEA reduce the size of the package?

This was recently an important thing to me when I finally got around to installing an HF rig and PK-232 at the Nav Station in my sailboat. The desk space is limited and the TNC is as large as the VHF rig and has a footprint as big as the HF rig.

Some companies, like Pac-Comm, have adventured into miniature products. Their satellite units are tiny, and some packet units are just as small, yet the market leaders in multi-mode remain large. Probably, the first tiny multi-mode TNC will find great success and will bring a new market leader.

DO YOU HATE CATALOGS?

It is hard to imagine how many mail order catalogs the Postal Service handles each year. It costs them thousands in gasoline and foot power just to get all that bulk to my door. Most get trashed sooner or later, and when I want a particular catalog, the one I find is a least two seasons old.

Recently, one of the electronic catalogs arrived at a time when I was in a reading mood and got a thorough going over before reaching the curbside container. Speaking of small and powerful, today's offering in consumer and business electronics shows what can be done. The mass market for these devices like notebooks, calculators and calendars, has afforded the design and marketing funds necessary to continue the shrink.

As noted previously, the size of the amateur market is a big disadvantage. Companies just cannot get the volume necessary to spend big chunks on product development and tooling which is required to keep us up to date with industry or even the house wife.

Only after the components of the devices we seek are commonplace in equipment for the mass market, do we benefit with newer designs.

WHAT'S NEXT?

There is a thread to all this and here it comes! What we have seen happen in the last three decades is fixing to be overshadowed and upstaged. The next big event to shape the tools of the world is SDI; "Star Wars." The Strategic Defense Initiative, was I believe born on a movie set somewhere just west of the California hills. When Ron Reagan proposed the idea, I thought that he had no idea of it becoming a reality, and that it just made an interesting and useful line in the script.

Even now, I still think that is about how it all started, but like most other things the govern-

ment undertakes, there is onward momentum. The money we have spent went to people who didn't think of it as a joke or even fiction. They have taken the dough, and forged ahead. We may or may not have any more protection in space, but you can rest assured that what is being done in research with lasers and the like, will soon affect you.

Right now a lot of the atom splitting that is being done is still a secret and is not available to industry. Later, if funds for the research, both military and private, dwindle as surely they must, the industry leaders will use all the new found science to create products to serve consumers of the world.

It's just around the corner and I am looking forward to the next round. Maybe, just maybe my next multi-mode controller won't have to have three cables hooked to all the other supporting equipment and will be no larger than a deck of cards.

TECHNICAL UNDERGROUND . . .

SDI is a good example of things happening that we see little and know little about. In the US, Europe and Japan there are groups that are working on scientific projects that would amaze us if known. This is not one of my "fiction paragraphs," but rather an informed observation that you may have missed. Keep an eye out and you can see the tips peeking through the fog.

Military money feeds some of the research, but industry and government other than military is also at the forefront. When you think about how important technology has become to national and regional economic survival, put that with the new battle beginning between a consolidated Europe, Japan and the US, it's hard to overlook what is happening. It's out there, but underground, until the time is right for some nation or region to benefit.

You know technology has reached an all time high when lasers are put into the hands of doctors. There is no telling how many of the wrong things have been cut off; but wait until your new laser soldering iron arrives. You can really do a number on that errant connection.

NOW AND LATER . . .

There were several topics I had wanted to cover in this issue but both time and space require they be saved for the future. Most relate to my latest adventures refurbishing my eleven year old, 36 foot sailboat. You can look for some comments upcoming about such topics as LORAN, SATNAV, the GPS satellite navigation system, 12 volt wiring and battery power.

However, one thing that I have found to be indispensable is NAVTEX. In fact, my whole navigation station is build around the HF rig and PK-232. Realize first that the marine use of VHF is absolutely necessary in coastal shipping and cruising; but as we all know there is severe limitation to the distance VHF covers and in the middle of the Pacific, Atlantic, Caribbean, or Gulf of Mexico, there are no towers and VHF transmitters or repeaters.

It didn't take me long to figure out that the only logical way any boater has to get information at sea is via HF radio. There are many stations broadcasting weather by voice or RTTY and have been vastly important to ships on the high seas. Now though, NAVTEX is there to provide the Sitor transmissions which give all the information necessary for both distant and coastal locations. In the past, the mariner had to consult all sorts of advisories and pilot manuals to get the latest information regarding buoys and changes to navigation aids noted on charts. Now, instantly that information is available.

For those not having a need to use what NAVTEX offers, it still can be interesting. For example, you can hear information about military exercises and tests or emergencies at sea. It is both useful to some and interesting to most.

My station, because of the battery power, uses an Icom 735, PK- 232 and Radio Shack Model 100. Since NAVTEX is only transmitted at certain times, I turn the system on using a previously tested memory channel to assure the frequency is accurately set, and tell the Model 100 to "download." The PK-232 will only send the NAVTEX messages I instruct, so when it is likely that some information is there I take a gander. After the transmission, I have all the messages of current interest in a computer file for review.

It might be useful to understand that everything I am doing to outfit my boat is done with reliability in mind, and automatic operation where possible to permit single-handed operation of the 10 ton vessel. Unfortunately, there is no backup system for the TNC and NAVTEX receiving station other than looking at the horizon or sky.

TEASERS - TWO AT A TIME . . .

Many times, we find ourselves with a few minutes, or perhaps a few hours with not much to do. Next time you encounter such a period, tuck this away as an entertaining thing to do (assuming you are absolutely bored and don't have anything at all worthwhile at hand).

Get a newspaper, preferably one from some other city. Turn to the personal ads, and read them. You may find some real entertainment; but be cautious. It might be a little dangerous to answer some of them!

If that doesn't entertain you try going out dancing on Monday night. I promise, all the dancing will be on the big screen and across the goal line.

Are you ready? ❑

(cont'd from page 3)

any participation in the amateur service, claimed telegraphy as a superior communications medium ..with telegraphers being model radio operators. They argued "..Morse code is the most effective means of communicating and the only one which can be used under the most adverse conditions." "All hams must be prepared to use code in an emergency situation." We do not desire to have individuals join our ranks that would have us lower our standards."

Another contention was based upon the need to maintain tradition. "I had to take the code when I got my ticket, so why should someone else pass the code up?" "I believe everyone should be blessed with the glory of learning code before operating in the amateur frequency spectrum."

The FCC acknowledged the responses clearly confirmed that the amateur community was undergoing a dramatic shift in sentiment concerning the value of Morse code as an entry level license requirement. "Modern commercial and military electronic systems require engineers to design them, technicians to install and maintain them, and a technologically literate citizenry that can use them. The amateur service should as it has in the past, attract technically inclined persons, particularly the youth of our country, and encourage them to learn and to prepare themselves in the areas where the United States needs expertise."

The FCC added, "We do not foresee that telegraphers will be in as great demand by future systems as will electronics and communications experts. ...We conclude that telegraphy skill is not so essential to proper operation of a station that transmits exclusively above 30 MHz such as to justify turning away otherwise qualified persons who to not possess the skill."

"We do not concur with the comments alleging that the passing of a telegraphy examination is an indication of the examinee's good character, high intelligence, cooperative demeanor, or willingness to comply with our rules. These

(cont'd on page 17)

by Mike Bryce, WB8VGE
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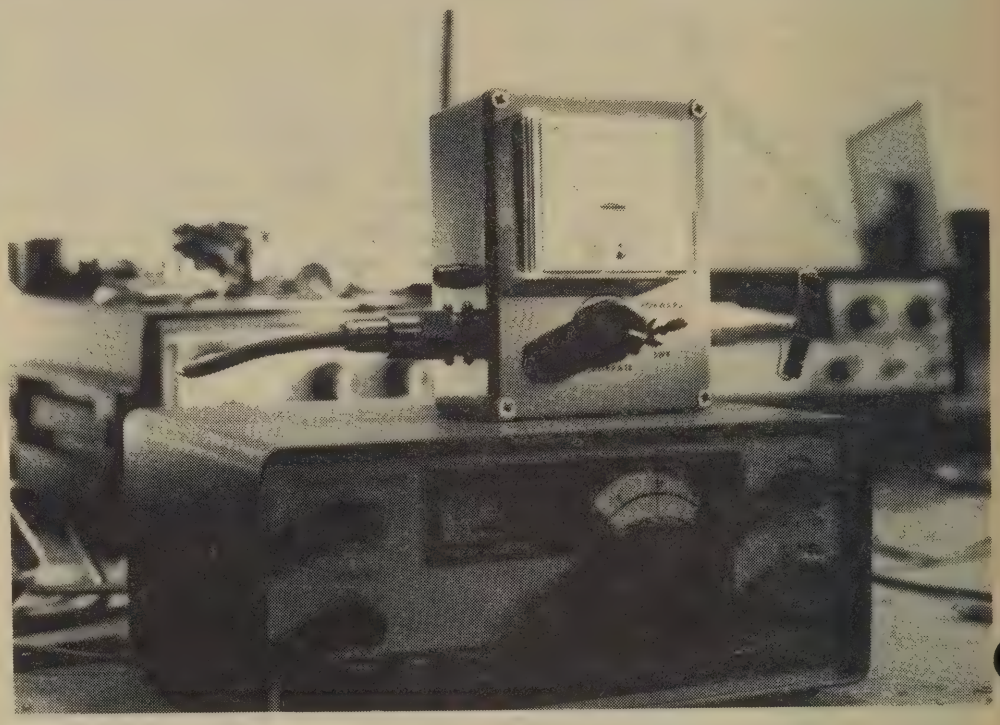
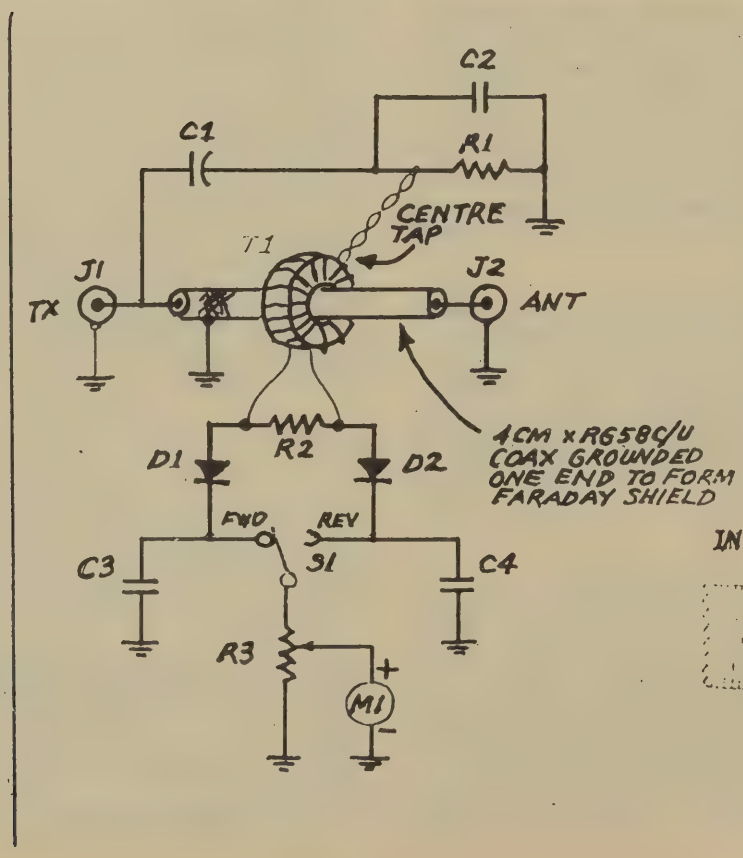
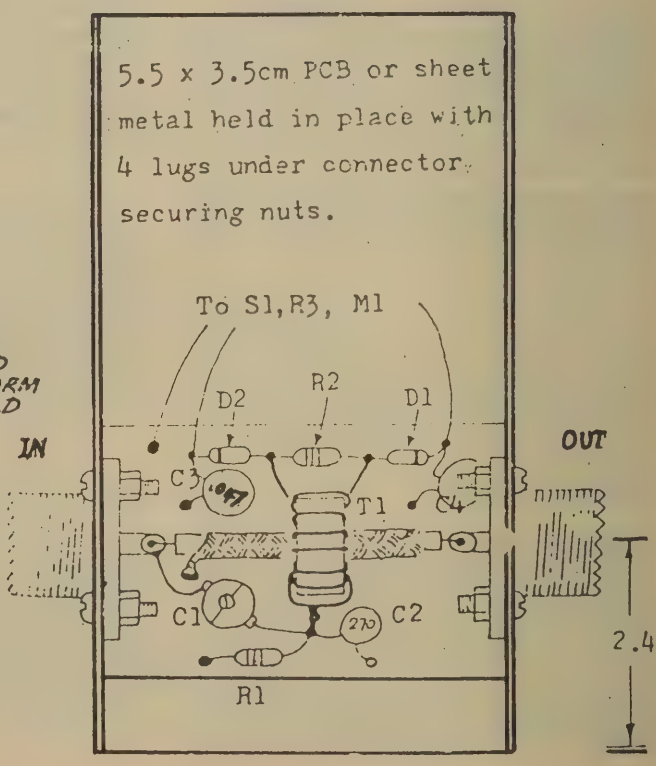
Constructing A Simple Qrp Wattmeter

To get the most out of low power operation, a good antenna is a must. However that good antenna is not alway handy. In some cases you can end up with a really bad antenna or no antenna at all. Armed with a good antenna tuner, we can usually load up the bed springs as the old saying goes. But what about the SWR? Unless your antenna tuner has a SWR/watt meter designed just for low power operation, it won't even move with two watts of RF! Most of the modern watt meters require up to ten watts of RF just to move the meter.

Most of the modern transceivers will begin to reduce their RF output when the SWR is only 1:2 or so. So, this month in Digital Digest, I have a simple construction project; a low power SWR meter. The meter to be described requires only one watt on all HF bands for fullPscale forward indication. The final circuit was derived after investigating several similar arrangements from various publications. Local parts are used with some noted exceptions such as the meter and toroids.







(cont'd from previous page)

A low SWR is very important to the QRP operator, as high efficiency is one of our goals. QRP, at least to me, means portable operation also. I did not want a meter too big, or one to sensitive to be moved around without having to re-set the adjustments.

The theory behind the meter is simple. The signal travelling from TX to the output jack establishes an electric field between the inner and outer conductors, and a magnetic field around the conductors. The coax lines forms the primary of the transformer, T1 and so the alternating magnetic field induces a voltage in the center-tapped secondary winding, which is loaded by R2

C1 samples the electric field, and is so adjusted that when the load on the out side is 50 ohms resistive, the voltage injected into the tap of T1 aids the voltage in one half, and exactly cancels the voltage in the other half. Now any load which departs from 50 ohms resistive will cause less cancellation of the voltage in the other half, and so an indication may be given as to the degree of mismatch. The remainder of the circuit is self explanatory.

Because the circuit is simple, a PC board was not used. The so called "ugly" construction practice can be use here. If not, a small piece of perf-board will do. However, take a look at the diagram for a suggested method of construction.

The coax (jacket removed) fits snugly through T1 as shown. Care must be taken to ensure that the enamel on the secondary is not scratched by the coax braid. The components are self supporting and may be accommodated upon a suitable piece of sheet metal or PCB. The old fashion 1N34 germanium diodes were found to yield the best sensitivity. Don't use 1N914 diodes!

I used a small cast aluminum box to house the meter. Don't use a plastic cabinet, you'll want to keep stray RF from getting inside the meter and causing trouble. The meter I used was a hamfest/junkbox special. Full scale sensitivity of 200uA. While the meter specified is a 50 uA unit, this one seems to work fine.

I also used two different types of output connectors; standard SOP239s and RCA phono jacks. This way I avoided the need for adapters when connecting up the SWR meter to the transmitter.

You'll need several pieces of test equipment to adjust and use this meter. Of course, some source of low RF will be needed. Any Heath HW series of radio will work just fine as will as the Argonaut. If you can turn down the power of the "big" rig, that will work too. You'll also need a 50 ohm dummy load.

C1 is adjusted so that little or no reverse reading is obtained when the output connector is terminated with a purely resistive load. A satisfactorily load may consist of two 100 ohm 1 watt carbon resistors in parallel. This is a lot easier than fighting with the Heath Cantenna*.

Apply about one watt of RF on the highest frequency to be used. and adjust C1 for a null as indicated on M1 with S1 in the REV position. If the meter is to be calibrated, calculate the degree of mismatch for various terminations. For example the following: 33 ohms or 75 ohms represents an SWR of 1.5, 25 or 100 ohms is 2.0 and 18 or 150 ohms is 3.0 and so on.

The sensitivity calibrate pot must be adjusted so that a forward reading of full scale is obtained before checking the reverse reading. The sensitivity is quite constant from 1.8 to 30 MHz so the instrument may also be employed as an inline wattmeter after appropriate calibration.

That's about all there is to it. A simple project you'll reach for time and time again. The original idea was to take this SWR meter out in the field when operating QRP portable, but my meter spends most if the time on my work bench.

One last note. For those of you looking for the Hot Water Handbook look no longer. The handbook has been completely re-done and in fact has a new name; The HW-8 Handbook. If you're interested in modifications for the Heath HW series of radios, a copy of your very own can be purchased for $7.95 postpaid from me at the address above.

QRP SWR METER
Parts List

C1: 5~25 trimmer capacitor
C2: 270 pF
C3, C4: .047 pF Disc Ceramic capacitor
R1: 1K
R2: 56 ohms
R3: 10K variable
D1, D2: 1N34A germanium diode
(do not use 1N914s)
T1: 15 turns #20 on FT-50-43 core
M1: 0-50 micro amps, see text
S1: SPDT switch
J1, J2, connectors of choice.

Metal box, knob, and what nots

QRPers Rejoice!

The New HW-8 Handbook is ready to go.

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2.0 For The 500 & Other Machines

In my most recent comments on 2.0 in Digital Digest, I mentioned that there were rumors regarding the possibility that 2.0 would not become available for the a500 and the a1000. I'm very happy to tell you that "informed sources" very close to Commodore have indicated that 2.0 will be the standard operating system for all Amiga machines, with the single possible exception of the CDTV unit - which, if you take the CBM marketing people literally, isn't really an Amiga in the sense we like to think - that is, a home PC.

Our company is overjoyed by this situation; the thought of having to support two operating systems, one of which was ready to be retired (in our opinion) was truly formidible. No one here could really contemplat that, we just don't have the manpower. Someone would have to lose... so it's a very happy crew you find around here as a result of this news.

Commodore does yet another executive leadership shuffle

Here we go again. The new captain is from Commodore Canada; the old captain is now chief of multimedia, or some such thing. Reported with a straight face on the ticker lines as a "lateral" move for Copperman, my personal opinion is that he was gived a sop job so his contract wouldn't give Commodore indigestion. The new chief is an old Commodore hand, so perhaps he'll get into the swing of things quickly. He'd better, as Commodore is at the best point it's ever been at with respect to the Amiga, and you can lay that right at Copperman's feet.

Commodore supports "World Of Amiga"

Here's an interesting consequence of the leadership shuffle. World of Amiga, a Canadian based Amiga show, now has CBM's "official" support. With the new chief hailing from Canada, does it take a surgeon to figure this out? I asked my wife, N7LWZ (who is a surgeon), and she said "no". There you have it.

We (Black Belt Systems) like the Amiga World Expo shows, they are professionally run, and the staff people are the best in the world. We may also attend the WOA shows, but we'll have to wait and see. There is no chance that we will be abandoning the Amiga World Expo shows in the future, unless the entire nature of them changes.

Amiga Unix

It's here - No one at Black Belt is a Unix fan so we only know what we hear, but the facts are: It's shipping, it seems to be reliable, and the customers are ecstatic. The Unix Magazines are giving it very high ratings, and even Byte magazine, which has suffered from ill-informed editorial staff and the totally meaningless ravings of Jerry Pournelle (who is the living definition of a "computer illiterate" if there ever was one, in my opinion - and yes, I like his SF) has deemed to note that the Unix system is a fine effort. It sure must have hurt them to say that!

And about 2.0 (and the 3000)

We've got a brand new 3000 here, and it's got the latest version of 2.0 on it. I won't bore you with yet another 2.0/3000 review in detail, but I feel forced to say two things. First, that the 3000 seems to me to be the Amiga most of us had hoped Commodore would build someday; Second, that the current incarnation of WorkBench 2.0 is the operating system I know I had been hoping Commodore would create someday. I have to take my hat off to them; the Amiga no longer has any competition, which it looked like it might have with the introduction of powerful machines that used the i486 and/or OS/2. Windows, as you know if you've ever used an Amiga and a PC running windows, was never a threat in the sense of offering more than an Amiga could as an operating system. OS/2 is entirely another matter. It's big and it's slow, but it sure has a lot of power and features. WB 2.0, I'm very happy to note, has a great deal more to offer than OS/2. Yes, that's a big smile on my face.

One other thing... the 2.0 release manuals contain a very nice section on ARexx, which is now standard with the operating system. This was another thing that was up in the air for a while, no one really knew what the documention that was standard with the system would do as far as teaching the user how to deal with ARexx. Since ARexx is the best means, in the sense that it is very accessable, for the user to create system enhancements via interprocess communication it was a major issue in my mind. Commodore has done the right thing on this issue too.

Sound like I'm happier with Commodore? You bet!

AmigaPlus falls over and dies

This was really unfortunate. AmigaPlus, as most of you must know, was a fairly popular Amiga magazine. The best thing about it from our perspective was the high quality color printing used throughout. Oh well, Darwin told us how it would go. One good thing that has happened is that AmigaWorld, which is a magazine with about the same mix of useful information, has bought the subscriber list and will be sending all the AmigaPlus customers either new subscriptions of AmigaWorld, or an extension to their already existing subscription.

DCTV hits the streets

Just recently, Digital Creations shipped their long-awaited $499.95 DCTV composite video expander. We purchased one, and we're quite happy with it's quality - as you may know, composite video isn't the best medium for viewing and creating graphics, but this is a good solid effort that makes the best of a bad situation. The paint software that comes with the unit is reasonably full-featured, and has a few unique "twists" to it's operation that anyone who is an artistic type would certainly enjoy. The DCTV unit includes a slow scanning (10 seconds, approximately) color digitizer that can create nice images from a still composite image or camera. The unit itself is a small black plastic box, with cables that attach to both your RGB port and Parallel port. There is a passthru on the RGB cable, which allows you to leave your RGB monitor hooked up; unfortunately, you can't see any of your "normal" Amiga screens on the DCTV composite output. All in all, a very nice effort.

M.A.S.T. ColorBurst

This unit is still not out; M.A.S.T. continues to advertise it. A very dissapointing situation for Amiga users. I really don't have much more to say about this, at least that I feel comfortable setting down in print.

Impulses Imagine Ray Tracer

Last time, I said I'd give you the straight skinny on Imagine. Well, we've got it, and I have spent a number of hours with it. Conclusion? The program is great - the manual needs to be recycled. If you're a die-hard ray trace fan, then this program is a must-have; nothing touches it for power and flexibility. Learning to use it has to be an excercise in love, or it turns into an

excercise in frustration. So what is the problem with the manual? Too many assumptions... whoever wrote that thing assumes you know things about the software that you've not yet been told. The net result is that you can't do much, even the tutorials, until you've read both volumes of the manuals provided. It might not even be so bad if you went into this adventure knowing that; unfortunately, we didn't know... so we wasted a lot of time trying to do things as specified in the book, which simply don't work if you don't do those little intermediate steps the tutorials and examples leave out. Bottom line, a fine product from a good company that really needs to hire a technical writer, and keep their programmers.

That Heathkit Weather Computer

Just a short note - we got it, we built it, it worked the first time. It's a very nice piece of gear. I've got it hooked into one of the serial ports on my 2500/030, and it responds just fine to any inquiries you make of it. No special support software written yet... not enough time available to write it, and I'm currently thinking it will be summer before I can get the time.

Black Belt introduces "Image Professional"

This product is a high-powered 24 bit image processing software tool set. It includes over 100 basic image processing functions, some of which have never been available in software before. It can handle images of any size, and any number of images (based upon how much memory you have). We have worked with single 1000x1000 24 bit images, which take 4 megabytes of memory to hold them!

Image professional, or "IP" as we like to call it, allows merge and rub thru with user variable blending from one image to another, and working as fine as the single pixel level. The system allows operating on areas that are defined by ellipses, rectangles, or a freehand region. You can even define the region using ARexx macros on a pixel-by pixel basis.

IP is a free addition to the HAM-E software, which now includes the highest powered paint on the Amiga, the highest powered image processing on the Amiga, robust file conversion software, and specialized rendering tools for creating the special compressed 24 bit HAM-E image files. So far, the HAM-E is the clear leader for Amiga graphics add-ons. Part of this is of course due to the fact that it's been shipping for a while, but a great deal of it is due to the fact that the system is the best performer, overall. No display device is ever any better than it's support software, and we do have the best, no matter whether you measure it by counting features, measuring speed, or by the reliability of it's operation. Since I have this nice platform in Digital Digest, I'd just like to publicly say "thank you" to all our customers. You're the reason I haven't had time to do that Weather Station software!

Next Time

In my next report to you, I hope to bring you the news that 2.0 is final, in ROM, and available at your dealers. I think there is a real chance, this time. Let's hope so! ❑

(cont'd from page 13)

traits are also found in individuals who have not passed such a test. For regulatory purposes, passing a telegraphy examination is no more and no less than proof of the examinee's ability to send and receive texts in Morse code as some specified rate."

FCC Rules on Codeless Ham License

Instead of enacting its controversial proposal for a Communicator license, the FCC on Dec. 13 removed the 5 WPM Morse code requirement from the existing Technician Class amateur operator license. Praising Amateur Radio for its achievements, the five Commissioners voted unanimously for the change.

Implementation of the new rules takes place on February 14, 1991. Applicants who have already passed the Novice and Technician written requirements during the past year will be immediately eligible for the new Technician class.

At the same time, the FCC voted to change the Part 97 Regulations to include the procedures for exempting handicapped Novice and Technician hams from the 13 and 20 WPM Morse tests required for upgrading to higher license classes. The 5 WPM Morse test will continue to be required of all amateurs who desire HF operation. The FCC told us that they were preparing additional instructions to doctors and volunteer examiners which will be issued shortly.

Current holders of Technician licenses will be 'grandfathered,' meaning that they will keep all of their current privileges (including HF privileges). After the new rules go into effect, new Technician licenses will receive all amateur privileges above 30 MHz enjoyed by Novices and current Technicians.

Codeless Technician Qualifications...

The "new" Technician exam will consist of 55 questions from the current Novice and Technician elements 2 and 3A. The multiple choice exam will not include five proposed special questions about Morse code's "utility and tradition" as requested by the ARRL. Element 2 (30 questions) and 3A (25 questions) need not be taken at the same time.

The FCC said they decided not to adopt their proposed Communicator Class because "...the addition of a sixth (Communicator) class to an already intricate license structure is neither desirable nor achievable without unacceptable effects upon our workload."

Furthermore, the FCC found that their present computer system will not support six classes of licenses without new and significant costs. "A new Communicator Class of license, consequently, is not a viable solution."

Technician Plus CSCE...

Codeless Technician licensees who pass the 5 WPM test will not receive a new callsign, nor will they have to use a suffix or other specialty station ID. The Commission said they were "...persuaded by the comments" not to require use of a two letter (/AC) station identification indicator system to distinguish stations having Technician Plus privileges. "Shorter call signs ...generally are reserved for the more accomplished higher class operators."

The new rules will not prescribe an official name for Technicians who have HF privileges. However, FCC staff told us they expect the name "Technician Plus" to be widely used in place of "Technician Plus 5 WPM Morse Code."

The commission initially proposed a "Communicator plus CSCE: operator class which would recognize that Communicator Class licensees hold a Certificate of Successful Completion of Examination (CSCE) showing the licensee has passed an international Morse code test. A CSCE is a document certified by three examiners showing that an examinee has passed certain written and telegraphy tests. "To avoid an increased license processing burden, our proposal was that the documentation of the passing of the telegraphy examination be indefinitely evidenced by the CSCE rather than by the issuance of another license."

Even though the VECs and ARRL thought an upgraded license should be issued, the FCC disagreed stating that the testing community already performs the necessary work. VECs would merely advise the FCC monthly the names of new "Technician Plus CSCE Class" operators. The VECs are presently in the process of implementing a Tech Plus database.

Codeless Novice Class...

The FCC decided not to adopt a codeless Novice Class because it "...has very limited privileges above 30 MHz. The Technician Class,

(cont'd on page 23)

by Johnathan L. Mayo, KR3T
3908 Short Hill Drive • Allentown, PA 18104

Constructing RS-232 Cables

The Jan/Feb 91 issue that you are now holding is the fourteenth issue of Digital Digest, and I'd like to start this new year by briefly reviewing the topics that have been covered in this column over the past two plus years. The Computers column has been a part of Digital Digest since its inception and is intended to cover general computer topics related to amateur radio digital communications, particularly those topics not represented by a specific column in Digital Digest.

There are presently three computer specific columns in Digital Digest (IBM Arena for IBM PC compatible users, MacHam World for Macintosh users, and Amiga Corner for Amiga users). These computers represent the majority of personal computers used in amateur radio digital communications; however, there are undoubtedly many others (the TRS-80s and Commodore 64/128s come to mind). I try to include information about using a wide variety of personal computers in amateur radio digital communications in this column. When I run across information specific to a computer not covered by a specific column, I pass it along to you here. There are also many machine independent topics (such as RFI) that owners of all personal computers would find relevant. One of the best sources of column ideas and information is from readers like you. I encourage you to pass along any information that you feel other readers might find of use.

It is said that the best prognosticator of the future is the past With that in mind, I'd like to list the topics that I've already written about in past issues. This gives you an idea of what types of topics you can expect in future issues. I like to keep covering new material, so I usually don't repeat a topic unless there is some new related information to pass along. Therefore, if you see a topic in which you have a special interest, please let me know so that I can plan to expand on it in future issues. So, without further delay, here is the list of past topics.

Nov/Dec 88 (Vol 1 No 1) -- A basic review of microcomputer uses in the ham shack.

Jan/Feb 89 (Vol 2 No 1) -- Part 1 on terminal emulation programs.

Mar/Apr 89 (Vol 2 No 2) -- Part 2 on terminal emulation programs.

May/Jun 89 (Vol 2 No 3) -- CodeMaster 100, a Morse code practice program for the TRS-80 Model 100.

Jul/Aug 89 (Vol 2 No 4) -- The RS-232 standard.

Sep/Oct 89 (Vol 2 No 5) -- Part 1 on computer viruses.

Nov/Dec 89 (Vol 2 No 6) -- Part 2 on computer viruses.

Jan/Feb 90 (Vol 3 No 1) -- Part 1 on landline telecommunications.

Mar/Apr 90 (Vol 3 No 2) -- Part 2 on landline telecommunications.

May/Jun 90 (Vol 3 No 3) -- I was not able to complete Part 3 of the landline series for this issue by the publication deadline due to a slight scuba mishap. In my place, Tom Arvo published an article on contesting and packet radio spotting by Gary Sutcliffe W9XT.

Jul/Aug 90 (Vol 3 No 4) -- Part 3 on landline telecommunications.

Sep/Oct 90 (Vol 3 No 5) -- Portable packet station.

Nov/Dec 90 (Vol 3 No 6) -- RFI.

So much for the past. In this issue, I'd like to expand on an earlier column on the RS-232 standard (Jul/Aug 89).

RS-232 Cabling

I briefly broached the topic of making RS-232 cables in my earlier column on the RS-232 standard, but there is much more ground to cover. I recently needed to attach a few new devices to two of my computers' RS-232 serial ports and had to make up some new cables. As long as I was at it, I decided to replace some of my other RS-232 cables at the same time.

I'll try not to repeat much of what was included in my earlier article on the RS-232 standard. This time, I want to concentrate on the mechanics of actually constructing the cables. However, to make sure that everyone knows what I'm writing about, I've included the following brief section on RS-232.

The RS-232 Standard

The reason we, as amateur radio operators, are concerned with the RS-232 standard is because most microcomputers and terminals as well as TNCs, multi-mode units, and other modem devices that are used in amateur digital communications support RS-232 communications. The RS-232 standard will most probably be encountered when connecting your hardware packet TNC (Terminal Node Controller) or other digital modem device to your terminal or computer.

The RS-232 standard covers four main areas. The first is the mechanical characteristics of the interface. The second is the electrical signals across the interface. Third is the function of each signal. And fourth is the subsets of signals used for certain applications. Virtually all hardware TNCs use the DB-25 connector as the port for terminal communications.

RS-232 electrical signals and their functions are referred to by four different systems: pin number, EIA designation, CCITT designation, and abbreviation of signal description. The following paragraphs provide information about the electrical signals most encountered when interfacing a DTE (Data Terminal Equipment) terminal (such as a personal computer) to a DCE (Data Communications Equipment) device (such as a TNC). Fortunately, the full set of RS-232 signals is rarely used; so we are able to overlook numerous signals without worry.

Pin 1 is referenced by the EIA as AA, the CCITT as 101, and the abbreviation GND. It serves as the chassis ground between the two devices.

Pin 2 is referenced by the EIA as BA, the CCITT as 103, and the abbreviation TD. This pin serves as the Transmit Data pin. All information sent via the RS-232 port comes out on this pin.

Pin 3 is referenced by the EIA as BB, the CCITT as 104, and the abbreviation RD. This pin serves as the Receive Data pin. All data received via the RS-232 port comes in on this pin.

Pin 4 is referenced by the EIA as CA, the CCITT as 105, and the abbreviation RTS. This pin serves as the Request To Send indicator. When the DTE has data to send, it asserts the RTS.

Pin 5 is referenced by the EIA as CB, the CCITT as 106, and the abbreviation CTS. This pin serves as the Clear To Send indicator. The DCE asserts the CTS when it is able to receive data from the DTE. According to the standard, the CTS may only be asserted after receiving a RTS from the DTE.

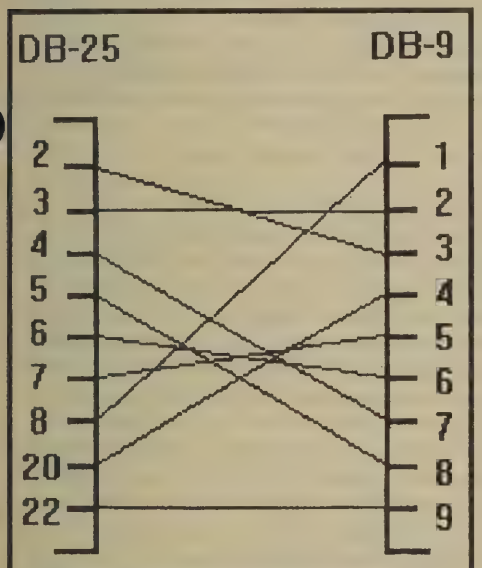
Pin 6 is referenced by the EIA as CC, the CCITT as 107, and the abbreviation DSR. This pin serves as the Data Set Ready indicator. It is

asserted as a response to the DTR signal and indicates that the DCE is ready for operation.

Pin 7 is referenced by the EIA as AB, the CCITT as 102, and the abbreviation SG. It serves as the signal ground. Pin 7 is the reference for all other pins and completes the circuit for the flow of current.

Pin 8 is referenced by the EIA as CF, the CCITT as 109, and the abbreviation DCD. It serves as the Data Carrier Detect (or just Carrier Detect) indicator. The DCE asserts this pin when the communications channel is ready. Many DTE will not transmit or receive data unless this pin is asserted. In some cases, pin 8 is wired to pin 20 so it is always asserted.

Pin 20 is referenced by the EIA as CD, the CCITT as 108/2, and the abbreviation DTR. This pin serves as the Data Terminal Ready indicator. The DTR indicates that the DTE is ready to send and receive data. The DTR is asserted whenever the DTE has data to send, or in some cases whenever the terminal is operating.



"Wiring diagram showing how to connect a DB-25 connector to a DB-9 connector for IBM-PC compatibles."

Cable Components

Since the cables I put together were going to be used in a RF rich environment, I decided to construct fully shielded cables. Additionally, I made two extra shielded cables to replace my older unshielded ribbon cables. There are many different types of cables and connectors that can be used to construct RS-232 serial cables. There are three main decisions to be made when wiring RS-232 cables: connector type, cable type, and number and type of pins.

The most common RS-232 connector is the DB-25. The DB-25 connector comes in several varieties. You must first determine whether your equipment needs male or female connectors. The male connector is known as DB-25P (Plug), and the female connector is known as DB-25S (Socket). While the DB-25 connector is the most common, especially on devices such as TNCs, many different connector types are used on various computers. The next most common connector is the DB-9 connector. It is very similar to the DB-25 except the DB-9 has only nine available pins. However, nine pins is enough for most RS-232 implementations.

Each plug comes in three varieties: solder type, crimp type, and friction type. With the solder type, individual wires are soldered to each needed pin. Crimp type connectors come with individual pins that are crimped to the ends of individual wires. The crimped pins are then inserted into the appropriate opening in the connector. Hoods are protective covers designed to fit over the back of the solder and crimp type DB-25 and DB-9 connectors and provide a convenient handhold for plugging and unplugging the connector.

The friction type, also called insulation displacement, connectors are for use with ribbon cable; usually 25 wire. The cable is simply placed in a slot on the back of the connector, and the connector is compressed. Connector pins puncture the ribbon cable's insulation and make contact with the wires. Friction connectors provide a convenient means to quickly wire all 25 pins. Nine pin friction type connectors are not common nor very useful in this application since we usually need to connect a nine pin connector to a 25 pin connector.

There are a wide variety of cables available. Too many, in fact, to give a full description in this column. While there are a wide variety of shielded and unshielded cables, just about any multiconductor cable can be used successfully. However, since I'm primarily interested in shielded cables, I'll limit my discussion here to those types. While there are shielded ribbon cables available, they are not particularly applicable here, as I suggested earlier, so I won't cover them either.

There are shielded cables with a foil shield, braid shield, and both foil and braid. Braid shielding is considered better than foil shielding, but having both is ideal. Cables with both foil and braid shielding are known as "doubled shielded" cable. I recommend using double shielded cable. Shielded cable with nine conductors is usually adequate for most applications. If you need a fully RS-232 compatible cable, get 25 conductor cable; however, make sure the devices you're connecting don't have any unusual or nonstandard signals on some of the lesser used pins. Also, keep in mind that most devices don't have more than nine pins internally connected even though they have a DB-25 connector.

To complete the shielding, be sure to select shielded hoods for your connectors. I recommend using full metal hoods for maximum shielding. Metal coated plastic hoods are also available at a slightly lower price, but I'd get the metal hoods.

Shopping List

As any ham knows, a well stocked parts bin can come in very handy. To help you select a variety of RS-232 cable components to keep on hand for making cables, I've prepared the following list. The items on this list are items that I purchased at a local Radio Shack for my immediate cable needs. Of course, these are common items that you can get from most any electronics parts source. I've also listed the Radio Shack part number and price so you can quickly duplicate my shopping spree if you so desire.

(15) feet of 9 conductor shielded cable @ $0.59 per foot (278-775).

(15) feet of 25 conductor shielded cable @ $1.19 per foot (278-776).

(4) 25 pin male crimp type DB-25 connectors @ $2.49 each (276-1429).

(3) 25 pin female crimp type DB-25 connectors @ $2.99 each (276-1430).

(7) 25 pin DB-25 full metal hoods @ $2.79 each (276-1510).

(1) 9 pin male crimp type DB-9 connector @ $0.99 (276-1427).

(3) 9 pin female crimp type DB-9 connector @ $1.19 each (276-1428).

(4) 9 pin DB-9 full metal hoods @ $2.19 each (276-1508).

(1) Crimp tool @ $9.95 (276-1595).

The items I selected were determined by the items I needed to connect as well as items that I might need to connect in the future. I was connecting devices to two IBM PCs. All of the devices had DB-25S connectors, so I needed several male DB-25P connectors. The IBM PCs require a DB-25S or DB-9S connectors on the other end of the cables. I have included a diagram that shows the appropriate connections when wiring a DB-25 connector to a DB-9 connector for use with IBM PC compatibles.

(cont'd on page 22)

(Cont'd from Page 7)

No AMTOR data controller in the world can synchronize to data characters. The only thing required for a synchronization signal is the idle characters that your AMTOR controller sends BY ITSELF.

2. How many times do we need to see "CQ" in an error-correcting mode?
3. How many times to we need to see our callsign in an error-correcting mode?

4. How many times do we need to see our SELCAL in an error-correcting mode?

The truth, in my opinion, is "very few".

I'd suggest that a more adequate and less wasteful CQ call in AMTOR might look like this:

{Turn on your transmitter and just LET IT SIT for five seconds!}
{Press the ENTER key once or twice here}
QRA W2JUP
CQ CQ CQ DE W2JUP (WJUP/MZUUPPP)
CQ CQ CQ DE W2JUP (WJUP/MZUUPPP)
CQ CQ CQ DE W2JUP (WJUP/MZUUPPP)
QRR ARQ/FEC
PSE KKK
{Press the ENTER key once or twice here}
{NOW turn OFF your transmitter}

The first thing to learn is NOT to start typing immediately! Let the data controller SEND its built-in idle characters so that anyone on the channel can automatically synchronize to your FEC signals.

Now type a carriage return and send your ID characters in some standard and legal format to mark the beginning of your FEC transmission:

QRA W2JUP
Then send two or three, perhaps even four lines of CQ call as shown. Three lines of CQ should be adequate, especially if you're calling directly on an AMTOR calling channel such as 14.075 or 21.075.

CQ CQ CQ DE W2JUP (WJUP/MZUUPPP)

If you're running a data controller that provides the recently adopted CCIR Recommendation 625 seven-letter IDENTITY SELCALs, be sure to include that seven-letter group after your "regular" four-letter SELCAL. The reasons are simple but perhaps not obvious to the AMTOR newcomers.

It's easy to derive the four-letter SELCAL from anyone's callsign. But it's NOT that easy to come up with the seven-character identifying code because there is no amateur radio standard yet! AEA does it one way. HAL may do it another way. I don't even know what MFJ does. I DO know that you can't assume that anyone can "know" the seven characters you're using for your IDENTITY under Recommendation 625. But how do you determine what your IDENTITY is?
In AEA's PK-232s, just type your callsign into the MYIDENT command argument. The controller automatically translates your callsign into its IDENTITY. Once you know it, just append it after your SELCAL.

Now you're ready to wind up your CQ call. Type something relatively informative to your listeners. Let them know that you'll accept EITHER an ARQ or an FEC call. Use the proper "Q" signal. Then sign over to anyone else. Don't use the "+?" signal because it just doesn't DO anything here!

QRR ARQ/FEC
PSE KKK

The "QRR" means simply that you're "ready for automatic operation" in either ARQ "chirpy" mode or in constant level FEC.

Be sure to type a carriage return or two BEFORE shutting off your transmitter. Don't leave the other guy's cursor out there in the middle of his screen! It's a very bad habit and generates much confusion - especially if the other guy is using an electromechanical printer or teleprinter.

By observing these tips, you've sent an efficient "CQ" call with minimal wasted bandwidth. If nobody calls you during at least 30 seconds, then you call again, repeating exactly what you sent the previous time. For maximum efficiency and minimal discomfort, I recommend that you "record" your "CQ" calls and store them as convenient disk files.

PACKET PROBLEMS
If you're into packet radio (and how many aren't?), you've seen plenty of formatting problems, although you may not have recognized them yet. Let's look at a few.

THE UPPER CASE DUDE
This guy appears to be the most common offender. You've all seen this one. You've all seen messages and texts sent by folks who simply either don't know or don't care that UPPER CASE is really HARDER to read than lower or mixed case. If this were not true, then all of our standard reading materials would be printed in UPPER CASE. Maybe the Chinese and Japanese are luckier - they don't seem to have CASE considerations.

I can think of no excuse - other than a broken keyboard - for anyone with a data terminal or personal computer made during the past ten years having to type everything in UPPER CASE. Sure, there must be a FEW of these rare, UPPER CASE terminals that produce ASCII characters, but normally they're not found in amateur radio.

Typing everything in UPPER CASE is just pure bad form! It's like SHOUTING AT EVERYONE FOR EVERYTHING! Granted, UPPER CASE is fine for lending emphasis to a few words or ideas, but that's really where it should end - emphasizing portions of a statement. Anything else is just typographical baloney!

I'm truly dumbfounded by the number of folks in packet radio who insist on typing EVERYTHING in UPPER CASE all the time. Save for a few, rare individuals with vision problems, there's NO EXCUSE for UPPER CASE ALL THE TIME! Frankly, even though I'm not into Unix, I'd rather see ALL of the typing done in lower case than all in UPPER CASE! It's really a heck of a lot easier to read!

THE LONG LINES DUDE
This one is an absolute gem. This sin is usually committed by the packeteer who doesn't know the difference between the packet parameter PACLEN and the length of his or her typing lines. They are NOT the same.

PACLEN sets the actual number of bytes or characters that YOU type that appear in a single packet frame. The standard TNC default value of 128 bytes means that IF you don't type a carriage return in LESS than 128 bytes or characters, then your TNC will actually SEND your packet frame on the 129th character you type. In this case, the packet frame will have exactly 128 characters in it. If you've reset the PACLEN (as many folks do!) to 256 bytes or characters, then IF you don't type a carriage return in LESS than 256 characters, then your TNC will actually SEND your packet frame on the 257th character you type.

How many of you have terminals or computers with screens wider than 80 characters? Yes, I've seen some screens with 132 character spaces. But I've NEVER seen a screen whose width would permit a single line of such size!

What happens is very simple. The average terminal emulator or communications program will do either of two things:

1. The long line runs off the right-hand edge of the screen, or

2. The long line is wrapped in some broken, inappropriate form, with split words and strange paragraphing structures.

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What do you do to prevent this? Simple -- type a carriage return at some point just short of 80 characters! (We assume here that you DO have your SENDPAC character set to be the default carriage-return character $0D or CONTROL-M.)

When you type the ENTER key to insert a carriage return at the right-hand edge of your screen, the text will be neatly formatted on the other station's screen or printer. No ifs, ands or buts. It looks neat, it is neat, and most important of all, it's easy to read.

THE INDENT DUDE

I wonder just how many of you have seen the messages and texts where the writer has carefully, diligently indented paragraphs of text. I'm sure you know the kind I mean.

Indenting text is fine for letters sent my mail, and for other non-radio communications. It's very acceptable when you're carrying on your communications via telephone modem or even on very good VHF data links. But on the frequently cruddy VHF/UHF links, and especially on the unforgiving HF links, indenting can be rather detrimental to efficiency. In the extreme case, indenting can be next to a capitol offense!

Formatting a packet message or a text file with an editor or a document-oriented word processor allows a lot of freedom to the writer. But every NEEDLESS "space" character or byte is wasted bandwidth. Each time someone sends indented signature lines, emulating the stuff done in sending a mailed letter, the sender is wasting both time and data bandwidth. And that is a practice that should be strictly shunned in the average, run-of-the-mill packet message.

Leave the fancy line formats and indents out of your packet messages whenever possible, UNLESS the indenting really is important or is intended to have a specific effect on the meaning of the message. Justify everything directly to the left margin whenever possible.

THE JUSTIFICATION DUDE

This is another real pain in the whatsis! Some text editors or word processors sometimes offers the writer the temptation to "justify" the text of the message. Many word processors or text editors "justify" the text by putting in the extra space characters in a semi-random fashion. Sometimes these extra spaces are inserted in groups of two to five or even more "space" characters.

Now I ask you, sincerely, what is the sense of inserting great gobs of extra "space" characters into a message text simply to make all the right-hand line endings come out at the same point?

Don't justify texts that will be sent by radio UNLESS you're doing some project in which you're trying to send a so-called "finished" or "camera ready" piece of writing. And try to remember that the "good" desk-top publishing programs will do their OWN justification when told to do so.

SOME THOUGHTS IN CLOSING

What we "say" and how we "say it" when we use today's digital amateur radio forms a definite opinion in the mind of the readers. When someone sends a sloppy or poorly-prepared piece of message text, we can assume that either the sender is a newcomer, or the sender doesn't know what his/her stuff looks like, or the sender doesn't care what his/her stuff looks like. In any case, the physical appearance of text messages and files is an area that deserves increasing attention as our digital modes grow and become more popular.

When you see one of your local brethren and sistern making junque on your screen, take a few minutes to dump the screen to your printer if you can. If not, then save the text to a disk file and print it out later. Present the printout to the sender as a modest suggestion as to how things could be better. Take some time. Explain the situation with some patience. You'll never know how much appreciation you can win if you try. ❑

If you have news and information of interest to the digital amateur radio community, please let us know!

Kantronics Presents Digital Seminars...

Packet, RTTY, ASCII, AMTOR, NAVTEX/AMTEX WEFAX... yes, even CW are covered in a series of FREE seminars sponsored by Kantronics, Inc. through 1991. Seminars cover all you need to know to get started in this exciting and growing aspect of ham radio - from theory of operation to getting on the air. There will also be a drawing during the seminars for valuable digital gear.

A current schedule of seminar dates and locations include Atlanta, GA (March 8-9); San Francisco, CA (May 18-20); and Seattle, WA (July 12-13). For more details as to specific times and locations write or call:
Kantronics,
1202 E. 23rd Street, Lawrence, KS 66046
(913) 842-7745 / FAX: (913) 842-4476 ❑

(cont'd from page 9)

The TAPR/AMSAT DSP device is not yet complete. Preliminary information shows that it will be based on the Texas Instruments TMS320C25 chip, and will take the form of a plug-in card for IBM PC compatibles. A stand alone DSP box may also be in the works. The TAPR/AMSAT card should sell for about $300 in kit form.

The advantages of DSP multi mode interfaces should be fairly clear by now. With a one time investment, you will be able to operate all current modem standards. Currently, if you want to operate the Microsats, you have to purchase an external modem designed to work with their standards. To operate a high speed packet link, you have to add another external modem or two. And if they're any new standards, you'd have to buy another modem or modify one you already have. Additionally, the DSP modems will, in all probability, prove superior in performance to the standard modems we're presently using in our interfaces.

Conclusion

Digital Signal Processing technology is gaining a foothold in amateur radio. 1991 will be an exciting year for digital communications operators as more and more DSP devices are introduced. I'll endeavor to keep you up to date on the latest products and theory in the DSP arena. I hope you enjoy this column and find it informative. Please contact me with any comments, suggestions, or questions. I prefer E-mail to CompuServe (72276,2276) or Prodigy (SCSD46C). ❑

(Cont'd from page 11)

volts. I cut a simple dipole right for 14.060 that folds up and stores quickly. The whole setup fits in a little box. Add an inexpensive SW portable for a receiver and I'm on the air from anywhere.

25) AND MORE! Buy some of those ham books you see advertised or take them out from the library. The Walter Thomkins and Cynthia Wall adventure books are mind candy! They're a blast. Get something on QRPing or an antenna book, The Complete DXer by W9KNI or one of Doug DeMaw's construction books. Set up a ham-related computer BBS and fill it full of user files. Replace your feedline with good quality stuff. RG-214 is a must over RG-8 for long distances (if hardline is out of your budget). Cut an antenna for a WARC band and get on the air. Get into Foxhunts where you track a hidden transmitter. Launch a transmitter on a hot air balloon and have the gang track it. Get the blood moving again, and have fun! ❑

(cont'd from page 19)

The grand total for this collection of cable components is $88.43. That may seem like a lot of money until you consider the alternatives. A single five foot cable of equivalent quality will cost between $25 and $30. So, for the price of three commercial cables, you can make approximately five cables and have the crimping tool. Discounting the cost of the crimping tool, you can make the a $25 to $30 cable for $14. I do recommend getting the crimping tool, even though you might be able to use a pair of long nose pliers in its place. The crimping tool makes consistent, reliable crimps quickly. You could probably get away with just crimping the connection, but I always solder the connection also.

You could use solder type connectors rather than the crimp type that I've selected. Solder type connectors would work equally well. However, I prefer the crimp type (as long as they're also soldered) because I can easily see what pins are connected. With solder type connectors, all pins are present in the connector even though many might not be connected to wires in the cable.

Construction

Once you have gathered the appropriate parts that you need for your particular application, you can begin to construct the cable. I would recommend making a chart that indicates which color conductor you will use for which pins. Once this is done, you can remove the main insulation from each end of the cable, making sure not to damage the foil and/or braid shielding. I would recommend making your cables at least five feet long, unless you're sure you need a shorter one for some reason. Fifty feet is about the maximum length for an RS-232 cable.

With about an inch of the main insulation removed, unravel and fold back the shielding. Now remove about 1/8 inch of insulation from each conductor. You can now crimp on the pins to the individual wires. After crimping the pins, I recommend a quick soldering to insure a reliable, long lasting connection. Be sure to solder quickly so that you don't melt the insulation.

Now you can insert the pins into the appropriate openings in the connector, following the color/pin chart you made earlier. If you're using solder connectors, just solder the appropriate wire to the appropriate pin with the earlier warning about melting the insulation in mind.

The hoods go on next. Temporarily put the hood on the connector, and trim off any extra cable shielding that extends from the back of the hoods. If your hoods include a strain relief, make sure it's working properly. You may need to wrap some tape around the cable beneath the folded-back shielding if your cable is too thin for the hood opening. This often happens when using a 9 pin cable in a 25 pin hood.

Once you're sure the hoods fit properly, you can screw them together. There are usually two screws that are used to hold the two hood halves together. Don't forget to insert the two screws, with their included backplates, (used to attach the hood and connector to the reciprocal connector on the device you're interfacing with so it won't detach) in the holes in the front of the hood before fully tightening the other two screws. If you're confused by my description, take a look at a DB-25 or DB-9 connector, and you should understand what I'm trying to explain.

You should now have a serviceable, reliable, quality serial cable. You can use a continuity tester to make sure the pins are wired correctly. Once that checks out, you can connect the cable to your computer and whatever device you want to interface (TNC, modem, serial printer, etc.). If you've run into any problems that this article doesn't help solve, check my previous article on the RS-232 standard.

Other RS-232 Accessories

I've run across two unique RS-232 accessories that I'd like to pass along to you. The first is a RS-232 to current loop adaptor. If, for whatever reason, you still have a need to interface an RS-232 device to a current loop, you might find this device useful. The next device is a fiber optic RS-232 cable, which is the ultimate in RFI immunity.

Available from Inmac (call 1-800-547-5444 for a free catalog) for $95, the RS-232/current loop converter could be used to interface a teleprinter to a TNC or a personal computer to a paper punch. Many of you may not be familiar with the current loop, so a brief overview is included in the following section of this article

The fiber optic RS-232 interface is available from Jameco Electronics (1-415-592-8097 for a free catalog). Each connector (available in DB-25 male and female) is $49.95. A power supply for each connector sells for $24.95. 25 feet of fiber optic cable sells for $44.95, and 100 feet is $89.95. This device, while expensive, could be very useful in a high RFI/EMI environment where standard shielded cable just doesn't do the job.

Current Loop

The RS-232 and Centronics interfaces of the teleprinter era was the current loop. While the current loop is considered obselete these days, there is still a lot of current loop equipment floating around these days, such as mechanical teleprinters that were used to operate Baudot RTTY.

Electromagnets are used in teleprinters and related devices to detect the presence of mark and space signals. These electromagnets are triggered by the presence of an electrical current. Thus, by wiring all of the devices together in a loop, one device could turn the current flow on and off as was needed to transfer the Baudot codes to other devices connected to the loop, also called the local loop.

To give an example of how this worked, imagine an incoming RTTY signal is received by the TU (a RTTY only modem). As the received tones shift from mark to space and back in accordance with the Baudot code, the TU transfers this digital information to the other devices by triggering the flow of current in the local loop in accordance with the received signal. The teleprinter's electromagnets would be triggered by the flow of current through the loop, and through the teleprinter's mechanical systems, type the appropriate alphanumeric symbols on paper. At the same time, the tape punch could store the received code on paper tape - its mechanisms also controlled by the flow of current in the local loop.

The electrical characteristics of the local loop have varied over time. Early loops used a current of 60 mA at between 100 and 300 Vdc to trigger the electromagnets. With more modern teleprinters, the loop current was reduced to 20 mA. In the early days of the solid state revolution, many computer hobbyists used teleprinters to interface with the early personal computers, such as the Altair and IMSAI, by converting the current loop to a low voltage digital signal. Using such adaptors, like the one from Inmac mentioned earlier, it is possible to interface a current loop teleprinter with a RS-232 interface.

Conclusion

Knowing how to wire your own RS-232 cables is a useful skill to have. In addition to saving money, wiring your own cables allows you to customize them to your specifications. The world of the RS-232 standard is full of "non standard" implementations. The best way to be sure your cable will work is to read the manuals of the devices you want to interface. In most cases, diversions from the RS-232 standard are pointed out, and often cable diagrams are given.

As always, I encourage you to contact me with comments, suggestions, and questions. The best way to contact me is via Email on CompuServe (72276,2276) or Prodigy (SCSD46C). Let me know what you would like to see in future columns. ❑

(cont'd from page 17)

however, has a more difficult written examination and authorizes all privileges above 30 MHz. The conversion of the Technician Class to a codeless class, as allowed by the international Radio Regulations and as recommended by QCWA and others, therefore, is the logical choice." The FCC emphasized that Technicians licensed before Feb. 14, 1991 and who have passed a telegraphy test would retain their HF privileges.

Initially the FCC proposed a sixty question multiple choice exam consisting of 30 questions from the Novice question pool, 25 from the Element 3A Technician pool plus 5 from a new pool. In effect, applicants for the new codeless class would be required to pass the same written examination as is required for the current Technician Class license plus five additional questions.

The ARRL supported the additional questions, but the VECs pointed out that the only purpose of testing is to assure that the licensees are qualified to operate amateur stations on the frequencies authorized. "The deletion of privileges below 30 MHz does not call for an increase in the number of questions posed in the written examination for a Technician Class license," FCC agreed.

Discontinuing the Novice Class

The amateur community, while supporting the establishment of a codeless class, was uncomfortable with the prospect of discontinuation of the Novice Class. The comments indicated the Novice Class should be retained as an entry level for persons who do not have the knowledge to pass the written examination for the Technician Class license, but who can pass a telegraphy examination.

"The keystone of our proposal was to reprogram resources currently expended in processing new Novice Class licenses annually to processing the new codeless class license. Retention of the Novice Class, however, precludes reprogramming all of those processing resources for the new codeless Technician class. We estimate, however, that with our current resources we should be able to process the applications for new Novice and codeless Technician Class licensees. The Rules we are adopting, therefore, retain the Novice Class license."

The Novice examination will continue to be available under the current two VE system. Despite serious problems with fraudulent examinations, the Commission decided not to integrate Novice testing into the Volunteer Examining program at this time.

The Novice testing program is not affected in any way. Novice applicants may still be examined by two (General Class or higher) VE's who need not be accredited by a VEC. Unlicensed applicants may elect to pass the 5 WPM code exam before two VE Novice program examiners. Codeless Technicians must, however, upgrade to Technician Plus at the more formal three examiner VEC-coordinated test session. No-Code Technicians may not go back and pass 5 WPM under the Novice testing program before two VE's. ❑

Source: Excerpted from W5YI Report

(cont'd from front page)

We are pleased to now bring you dedicated info on DSP written by Jon Mayo, KR3T. Future installments will bring you a wealth of information on the theory, principles, technology and equipment deployed in this revolution in digital communications.

While on the subject of dedicated columns, we are eliminating Digital Bits and Software from the front cover sidebar. Since the information has been generally derived from various sources rather than from a single columnist it will now be part of the Digipeater. The info that was generally associated with the aforementioned columns will still be in the publication.

It is also with deep regreats we announce that Jim Mulvey, K1SA has informed us that this issue will be his last for "ACTION On The Ham Bands." Jim has been a great supporter of the publication, and has played a key roll in the growth and interest Digital Digest has achieved.

Alas, JIm's full time business and career as TV broadcaster and commercial producer have left little time for writing. For what little time might be left, Jim said that he would like to spend with his family. Sounds pretty noble and understandable to me, and we wish Jim all the best of continued success! As a footnote though Jim, if you find the itch, and the time to keyboard in a few words in the future... please don't hesitate to send 'em our way.

Meanwhile, we, and I am sure I can speak for all of our readers will miss you in the Digest, but will look for you on the ham bands... digitally speaking, of course!

Till next time, 73, Tom / WA8DXD

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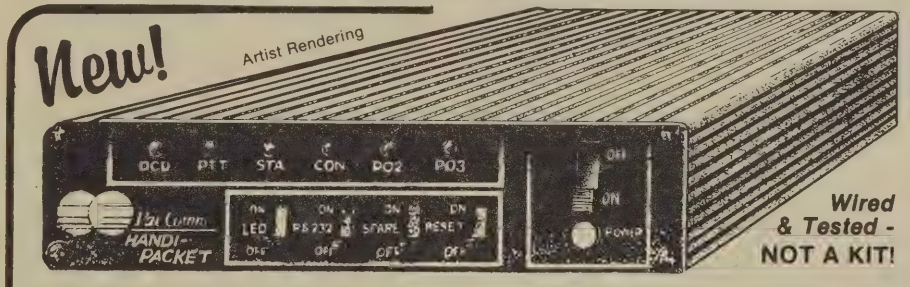

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by Joe Kasser, G3ZCZ
P.O. Box 3419 • Silver Spring, MD 20918

Mailbox & Message Handling Features

This issue describes the mailbox and message handling features built into LAN-LINK.

Answering Machine

LAN-LINK contains an AMTOR (Robot beacon CQ mode only) and PACKET Mode SMART "answering machine" facility. You can leave messages on your disk (in the same directory as the LAN-LINK.* files, if you are using a hard disk), for different stations. When someone connects to you, if you left a message for him, he (or she or even it as the case may be) and only that station will receive it automatically. No one else will normally be able to download that message.

Mail Beacon (Annunciator)

To ensure that people know that you have left a message for them a 'MAIL for' list is loaded into your Packet Beacon and transmitted every 30 minutes (Refer to the BTEXT command in the TNC manual) as ':QTC:' followed by a list of calls. If no mail is pending, or the only message in your system is one addressed to you, the beacon transmissions are inhibited. This conforms to good operating practice on crowded channels (at least inhibiting the beacon does).

The mail beacon in the AMTOR Mode is transmitted as part of the beacon AUTOCQ message. It is automatically updated when a message is transmitted. If you don't set the beacon (see below) you will not transmit a mail beacon text in your AMTOR CQ message.

The Mail beacon text is set up either when you tell the computer to set it up or when you disconnect a packet QSO from another station.

In this manner you may update the list while the program is running, for example by using Sidekick or the included Editor, to write a message, or preferably the NOTE feature.

Any station using LAN-LINK can be configured to automatically attempt a connect (QTC-Snatch) when seeing their callsign in someone else's LAN-LINK :QTC: beacon mail message list.

If for some reason the message got lost (e.g. because the link was marginal), :QSM: will get you a repeat of that message.

How to leave a message

You can use the note feature or type the message as a non- document file on Wordstar, the included Editor, or if you use another word processor, you must leave the message as an ASCII text file.

If you use the Note feature, the message will be given a header as if it came in from someone else. if you use a word processor or the included Editor to write the message, you will have to write in a header or show somehow that the message is not 'live'. You may then later time tag a message header on message files created by the word processor. In this way people will realize that it is an automatic message by seeing the header. On the other hand, you may wish to fool people into thinking that you are home.

You just name the message file as the callsign of the station to whom you wish the message to be sent at connect time. You must also give it the filetype of 'OUT'.

For example a message for G3ZCZ would be stored on the disk as a file named 'G3ZCZ.OUT', and similarly a message to 4X6AA would be stored on disk as '4X6AA.OUT'.

Once the message has been sent, an entry to that effect will be made in the LAN-LINK.RUN data capture file. The message file will then be renamed and given the file extension '.OLD'. At that time any previously existing mail file with the file extension '.OLD' will be deleted. This stops the addressee receiving the message on successive connects if you can't delete it for some reason (you forget) while at the same time, the message is still available to you in case you need it.

You should use a separate utility program if you want the calls in the mail beacon sorted. You may for example wish to sort them alphanumerically or in the order of the date that they were left in your answering machine.

Incoming messages triggered by the QTC-Snatch will be left in a message file '<yourcall>.OUT', which can be scanned by using the Alt-M Key combination. If you have non LAN-LINK friends, train them to trigger the QTC-Snatch by simulating a beacon, and prefixing and ending their text with lines containing the '>' as the only character. Better yet, give them a copy of LAN-LINK and tell them to register it.

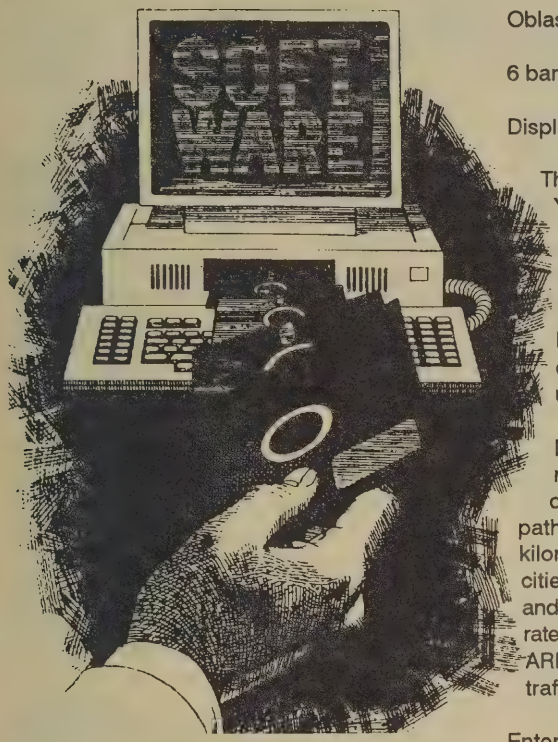
Remote Beacon Shutdown

I recognize that some stations may abuse the beacon facility of this program. I have thus built into the program a 'remote shutdown' capability. If someone running LAN-LINK has their beacon timer set too often, connect to them in the AMTOR or Packet Communications modes, and tell them to :QRT: which will clear their beacon mode and take them off the air for a while at least.

In the Packet Communication Mode, the CQ beacon is shut down but the 30 minute mail beacon is not touched. In the AMTOR Communication Mode, the CQ delay time is set to infinity. The LAN-LINK Mailbox will thus still be active in both modes, but will not call CQ on the air. ❑

LAN-LINK is available from the author. For an evaluation copy, download it from Compuserve or send $5.00, or send $35.00 for a registered copy which will entitle you to at least one free update. When you write in, say where you saw this Application Note.

For the latest news and conversation about developments in packet radio, regulatory affairs, computer software and more, GO HAMNET on the CompuServe Information Service. If you aren't a member of CompuServe and would like a free CompuServe introductory membership, call 1-800-848-8199 and ask for representative #48.



Software Review

N6RJ 2nd Op

Reviewed by Norm Brooks, K6FO

For some time now, I have been using the N6RJ 2nd OP. It is a sophisticated program written for use on IBM PC and compatible computers. This program is designed for the DXer, including those who chase DX on the satellites.

Once you enter c contact into the log, the program uses it in preparing whatever report you wish. No additional entries are required. For example, when you enter a USSR contact, the program automatically identifies the Oblast number of the station. Later, when you check whether you have worked 100 Oblasts, the program will give you a report on your W-100-O status.

Here are the summary reports you can generate from your DX log: DXCC countries worked/confirmed on one band, all bands, one mode or all modes with or without Oscar satellites.

DXCC detailed spreadsheet of worked/confirmed data for each band and mode with mixed totals for each band.

WAZ (Worked all Zones) worked/confirmed one mode, mixed modes or Oscar (one or more satellites).

Oblasts worked/confirmed summary.

6 band WAZ summary.

Display total entries in station log.

There are many "mind boggling" features. YOur entries appear in a huge file sorted in chronological order (just as a written log book), another huge file sorted in call sign order and 324 smaller files, each for a DXCC country. You can enter ALL of your log entries into this program, even USA contacts. They will, of course, be filed under "K-United States of America."

Each of these 324 country files provides a mass of data which is different for each, including: beam heading (direct and long path); distance (statute or nautical miles or kilometers); CQ zone and continent; city or cities to which above are measured; latitude and longitude; sunrise and sunset times; postal rate and IRC info; DX bureau address; whether ARRL handles outgoing QSLs; and third party traffic status.

Entering data is the easiest thing to do. A screen comes up on which you enter call sign, time, date, band, mode and remarks. The computer offers the current date and time, so they will enter automatically if you are logging in "real-time." The program recognizes the 9 WARC bands, plus Oscar, and provides function keys for easy entry. Modes are also provided with function keys. QSL sent/received data can also be entered as well as any notes you want to include with the entry.

The call sign feature is probably the most advanced of any DX program on the market. It will "decipher" just about any call sign, telling you the country to which it belongs. In some cases, the call sign may belong to two or more DXCC countries. It gives you the opportunity to select which it is. For example if you enter a CE0, it gives you the opportunity to identify whether the card is for Easter, San Felix or Juan Fernandez Islands. It used to be that the letter after the numeral in the call sign told you this, but that is no longer true. If you enter one of the "odd-ball" call signs that many countries are now using, it correctly identifies the base country. For example, entering prefix CX brings up VE-Canada.

The printing functions of 2nd OP are extensive too. You can print your complete log in several ways; all bands, one band, on band/one mode, one mode and for Oscar satellites. You can print detailed country listings by prefix, country name or continent. You can print complete reports on DXCC, Oblast and WAZ status by what you already have or what you need. You can even print labels to stick on your QSL cards. There are more printing options, too many to list here. Believe me when I say that if you're one who likes printed reports, you had better buy another box of paper.

I consider this program to be "user friendly." Most features of the program are reached by function keys, which are identified on the lower part of the screen. F9 brings up help screens, which are different at each step. You can't get into an inescapable "trap." F10 gets you out of the various levels of the program, and finally, F10 exits you from the program.

If you're into contesting, you will want to use the K1EA Contest Log program. Your log from it can be readily transferred to the N6RJ 2nd OP.

N6RJ 2nd OP is not copy protected (ugh). You can make whatever copies you need. However, you won't want to make copies for your friends, not only because it's illegal, but also because your name, call sign and address are imbedded in the program. The N6RJ 2nd OP users' manual, program and data files were conceived, designed and programmed by John Fail, KL7GRF. You can talk to him personally on Oscar 13 during most of the passes, at the "DX spot" 145.90 MHz. John also writes the DX column for Oscar Satellite Report (which no doubt explains why Oscar DX logging is included).

The N6RJ 2nd OP is available from Ham Radio Outlet (see their as in any issue of Worldradio for addresses and telephone numbers). The K1EA Contest program mentioned above is available from Bill McGowan c/o Yankee Clipper Contest Club, 33 Truell Road, Hollis NH 03049. (603) 465-2392. ❑

Excerpted from Worldradio Magazine

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by **Jonathan L. Mayo, KR3T**
3908 Short Hill Drive • Allentown, PA 18104

The Computer Controlled Ham Shack

Welcome to the first IBM Arena of 1991. This is the fifth IBM Arena column to appear in Digital Digest; the premiere column appeared in the May/June 1990 issue. IBM Arena is intended to provide a source for ideas and information for using your IBM PC compatible in amateur radio digital communications applications. I also try to pass along general information on IBM PC software and accessories that is applicable to other uses.

Computer Controlled Shack

The computer controlled shack is one topic that I've been working on for IBM Arena. Now that my IC-271A transceiver is back from Icom and working once again, I can continue with evaluating the various transceiver control software I have gathered. You can expect to see a few columns dedicated to this subject in the near future.

One of the programs I'm going to try out is Aries-2 from Ashton ITC. I recently received a letter from Thom Ashton informing me of their SCORPIO software for short wave listeners. SCORPIO stands for Shortwave Computer Operated Radio Plus I/O. By maintaining a database of stations, SCORPIO can automatically scan selected stations through a computer link with certain transceivers and short wave receivers.

Ashton also sells a preprogrammed database of frequencies for operation Desert Shield (now called Desert Storm). Over 600 entries cover military and civilian frequencies. SCORPIO sells for $89.95 ($79.95 for Aries-2 owners), and the Desert Shield database is $19.95. Contact Ashton ITC (PO Box 830, Danridge, TN, 37725 - (615) 397-0742) for more information.

Coprocessors

The main subject of IBM Arena in the September/October 1990 issue was coprocessors. I pointed out that a coprocessor can be a valuable accessory for many IBM PC users for a variety of reasons. Since that issue, I've run across some additional information that I'd like to pass along to you.

Quoting from my earlier column: "Keep in mind that there is no harm in using a coprocessor rated for a faster speed than the microprocessor. You can use a 80387-25 in a 20 MHz 80386 computer without any problems. It doesn't make economic sense to pay for the faster coprocessor when you don't need it though." My point was that a coprocessor rated for a faster speed than the processor wouldn't hurt anything, but at the same time the coprocessor wouldn't work any faster than a coprocessor rated for the same speed as the processor. However, I recently uncovered some information that contradicts this.

While trying to clear some shelf space by getting rid of old magazines, I ran across the 06 November 1989 issue of PC Week. PC Week, a sister publication to PC Magazine (a monthly), is a tabloid size magazine available to selected "qualified" individuals in the microcomputer industry. Inside the 06 November 89 issue was an article titled "Number Crunching Shifts into High Gear".

This article benchmarked the standard Intel coprocessors with the Cyrix and Weitek coprocessors. I'd like to pass along some of the results. Firstly, as I suggested in my earlier column, the Cyrix was faster than the Intel chips in most tests. Additionally, no incompatibilities with the Intel chips were discovered.

Secondly, and somewhat surprisingly, a Compaq 386/20e (a 80386 computer running at 20 MHz) completed the benchmarks 20 percent faster with a 80387-33 than with a 80387-20. Theoretically, as far as I know, this should not be. Perhaps the 80387-33 coprocessors have been slightly altered internally to work at 33 MHz, with the resulting efficiency accounting for the faster performance at lower speeds.

I have also run across another Intel compatible coprocessor that, like Cyrix, claims to run faster than the Intel chips. IIT math coprocessors are available for 80286 and 80386 microprocessors. They also cost 15 to 20 percent less than their Intel equivalents. IIT coprocessors are available from IC Express, the company I recommended in my earlier column.

Intel names its coprocessors in the same manner as their microprocessors but simply changes the "6" to a "7". Thus, a 80386 microprocessor uses a 80387 coprocessor. Cyrix calls its 80387 equivalent 83D87. IIT uses the name 3C87 for their 80387 equivalent.

The 80486

Prices of 80486 based PCs keep dropping, and they are now at the point where most new computer buyers should at least consider a 486 PC. As an example of how low current prices have dropped, you can buy a 25 MHz 486 from PC Brand for about $2,000. The economy of this becomes clear when you remember that the 486 includes a built-in coprocessor.

Since a 25 MHz 486 is slightly faster in mixed benchmarks than a 33 MHz 386, these two machines are fair comparisons. A 80387-33 costs around $500, so taking this into account, the real price of the 25 MHz 486 drops to $1,500. And $1,500 is about the current selling price of low-cost 33 MHz 386 machines. So, for the price of a 33 MHz PC with a coprocessor, you can have the latest in IBM PC compatible technology.

In order to help you decide whether you want or need a 486 based PC, I'd like to briefly explain what sets the 80486 chip apart from the 80386. The 80486 is not as significant an advance from the 80386 as the 80386 was from the 80286. In fact, the 80486 is, fundamentally, a 80386 with some enhancements. It's these enhancements that makes the 80486 a more powerful processor.

You've already been introduced to the 80486's internal, on-board coprocessor. By including the functional equivalent of a 80387 on the same slice of silicon as the processor, much of the complicated I/O protocols that allow separate microprocessor and coprocessor chips to communicate can be eliminated. The end result is much faster floating point calculations than is possible with two separate chips.

The 80486 also includes a built-in 8K memory cache and cache controller. Most 80386 systems include separate memory caches to speed up operations, so once again there is no gain in function. However, by having the cache system built-in, the 80486 is capable of operating much faster than an equivalent 80386 system. While the 486's 8K cache is of reasonable size, many manufacturers will opt to add additional external cache memory to increase the cache's effectiveness.

The 80286

With all the talk about the latest in IBM compatible computer technology, it's easy to get caught up in the desire to have the latest, greatest products. However, anyone who's been around the industry for a while will tell you that anyone trying to buy the latest technology is doomed from the start. Even if you elect to pay the premium prices that the latest technology demands as well as put up with the inevitable quirks and bugs inherent in new products, there is always something better out by the time you finally get down to using your new toy.

All of us, I think, want to get the maximum performance for each dollar we spend on computers and accessories. As it stands now in the IBM compatible computer industry, this point lies with the 25 MHz and 33 MHz 80386s - for the time being. With the introduction of the 80486, prices of 80386 systems began to fall. The 80386 is a very capable processor, and software has yet to tap its full potential.

The drop in prices of the 80386 caused the prices of 80286 to drop even further than they had dropped with introduction and evolution of 80386 systems. Today, 80286 systems are probably the best buy in basic IBM compatible computing. The vast majority of IBM compatible users would be well serviced by 80286 systems. Relatively few, I think, really need the performance afforded by 80386 and 80486 systems.

Even if you need or just want a fast 80386 or 80486 based system, consider getting an inexpensive 80286 system for use as a second computer for use in the shack, as backup in case your main computer breaks, or for troubleshooting use when you're not sure if that new memory card is really broken or is in conflict with some component in your main computer. I don't recommend 8088 based PCs for this role because their lack of 16 bit expansion slots limits their use as a companion to a 80386 or 80486 main computer. The final advantage to having a second PC is multitasking. For all the time, money, and effort I see people expending in an attempt to get two programs to run simultaneously their PC, the frustrated user could easily afford to purchase a 80286 system and multitask in hardware.

Prices for basic 80286 computers range from $400 to $600. At these low prices, it almost makes sense to buy two - provided you can figure out what to do with them. Of course, equipping the PC with a monitor, graphics card, and hard drive will increase your investment. However, if you're anything like me, you probably have enough spare parts from previous PCs and upgrades to outfit another PC or two. True, your spare monitor or graphics card may be out of date, but so is the 80286 you're going to put them in.

Adobe Postscript Cartridge

For those of you with Hewlett Packard LaserJet IIs, I'd like to digress briefly and discuss the Adobe Postscript cartridge. LaserJet II owners, like me, have probably felt left behind as HP introduced the Laser Jet III. The LaserJet III is an excellent printer, and LaserJet II owners can upgrade their printer to include the new features of the LaserJet III for about $1,100. The two main advances of the LaserJet III are scalable fonts and enhanced resolution.

The enhanced resolution allows the LaserJet III to adjust the print resolution up to 600 dpi (dots per inch). There's not much LaserJet II owners can do about adding resolution enhancement, short of paying $1,100 for HP's upgrade or buying a LaserJet III. Since a new LaserJet III sells for around $1,400, it really doesn't make sense to have a LaserJet II upgraded (and I suspect HP has not performed many upgrades because of this).

The scalable fonts are a nice addition to the LaserJet III. HP PCL (Page Control Language) has long suffered because of the lack of scalable fonts. Scalable fonts allow the printer to automatically adjust the size of text. With non-scalable, or bitmapped fonts, a separate file must be maintained containing instructions for the printer to print text at a certain size. If you wanted to print text in, say, four different sizes, you had to have four separate bitmap files.

Unfortunately, HP's new scalable PCL is not compatible with the current industry standard scalable font language - Adobe Postscript. While there is a Postscript cartridge available from HP for the LaserJet III that allows the printer to function as a Postscript printer, it is not compatible with the LaserJet II. There have been many ways to add Postscript to the LaserJet II, but the new Adobe Postscript cartridge is, in my opinion, the best.

I recently purchased the Adobe Postscript cartridge for my LaserJet II, and I'd like to let you know a little about it. Before getting the Postscript cartridge, I had to keep several megabytes of bitmapped font files on my hard drive and download them to the LaserJet II before printing. As anyone who has played with bitmapped fonts can tell you, bitmap fonts are a pain to work with. Getting applications to recognize downloaded fonts is not always easy. With Postscript, things are much better.

The Adobe Postscript cartridge for the LaserJet II sells for about $250. In addition to the cartridge, you must have at least 1.5 megabytes of RAM in your printer. The LaserJet II comes with 512K, so you'll also need a 1 megabyte memory board if you don't yet have one. The Postscript cartridge plugs into one of the cartridge slots on the front of the printer. Once plugged in, the printer acts as a Postscript printer. However, it is easy to switch back to the native HP PCL mode using the front panel.

Printing speed with the Adobe Postscript cartridge is excellent. Postscript is inherently slower than PCL, but the cartridge is about as fast as Postscript gets. The ability to easily switch between Postscript and PCL is another good feature of the cartridge that is unique to this product. So, if you've been looking to modernize your LaserJet II, look no further than the Adobe Postscript card - it's highly recommended.

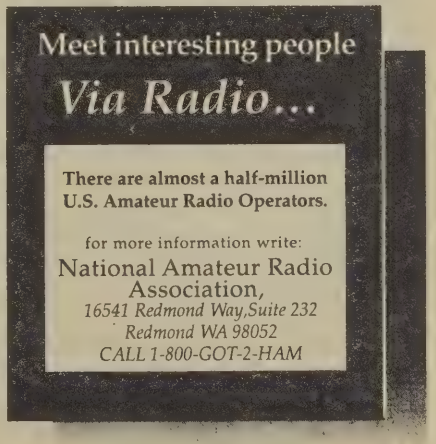
IBM versus Mac

There has traditionally been a rivalry between users of IBM PC compatible computers and Apple Macintosh users. The graphical interface of the Mac at first brought laughs from PC users, who were used to the command line driven PC-DOS. With the popularity of the Microsoft Windows graphical interface for the IBM PC, Mac users seem to have won the battle (Of course, we PC users can turn the graphical interface on and off at will).

To add further fuel to the still raging debate, I ran across an article in CompuServe Magazine about word processing on IBM PCs and Macintoshes. The article reports that IBM PC users are better writers than Mac users. A writing instructor at the University of Delaware studied the matter and found that PC writers used more complex sentences and wrote on the twelfth grade level, compared with eighth grade writing skills for Mac users. So the next time you're arguing with your favorite Mac fanatic, use this information to your benefit.

Conclusion

This column has covered a wide range of topics that I hope you found interesting. I'm working on several ideas for future topics as I've outlined in earlier columns. Please let me know if you've run across any products or information that other readers might find useful. As usual, I encourage you to contact me with your comments, suggestions, and questions. I prefer E-mail to either CompuServe (72276,2276) or Prodigy (SCSD46C). ❑



by Stan Horzepa, WA1LOU
75 Kreger Drive • Wolcott, CT 06716

Six Serial Ports Per MAC

Here's the problem . . . I wanted to monitor the SAREX packet radio station on a 24-hour basis and I also wanted to continue running my TCP/IP packet radio station on 144.91 MHz on a 24-hour basis. I had enough radio equipment and TNCs to do the job and my Mac IIci is very capable of doing more than one thing at once, but I had only one serial port available on my Mac (the other serial port was mated to my printer).

I could have divorced my printer from the second serial port and mated it to a TNC for the duration of the SAREX mission, but I typically print something or other on a daily basis and the recabling and software reconfiguring that is necessary when switching between printing and communicating is inconvenient (I would call it something other than "inconvenient," but this publication is rated G).

As the SAREX mission date approached, I thumbed through one of the Mac rags and saw an advertisement for a product called QuadraLink(TM) that claimed to add four serial ports to my dual-ported Mac for a grand total of six serial ports. I telephoned Applied Engineering, the producers of QuadraLink, to find out a little more about the product and after a short conversation, I was convinced that QuadraLink was what I wanted. With plastic in hand, I next telephoned my favorite 1-800-Mac dealer and ordered one QuadraLink, which was FEDEXed to my doorstop by the next morning.

Four More Ports Are A Snap!

QuadraLink consists of two parts: a card that is installed in a NuBus expansion slot of a Mac II and software to run the card. The card installation was simple. If you have installed Mac expansion cards before, the QuadraLink installation should take no more than ten minutes. If this is your first expansion card installation, it may take eleven minutes. Just power down the Mac, pop the cover and touch the power supply to get rid of any static electricity from your body. Then, pop out the expansion slot back panel, pop in the card, replace the cover and connect your peripherals to the new serial ports. (The QuadraLink serial port connectors are mini-8 DIN connectors. . . the same as the Mac uses.) Installation is a snap or should I say, "a pop" (definitely not "a crackle").

The software is a combination INIT and Control Panel Device (or "CDEV") that you drag into your System Folder. After installing the software, I restarted my Mac and opened the Control Panel under the Apple menu to configure QuadraLink.

Under System 7, you can use all six serial ports simultaneously, but until System 7 arrives later this year, you can only use two serial ports simultaneously. You may say, "but I can do that already!" This is true, but QuadraLink, under the current System permits you to connect six peripherals and switch between any two of them at will.

Switching Ports Softly

Under System 6.07 and earlier, the Mac recognizes only two serial ports. One is called the "modem" port and the other is called the "printer" port, however, despite their names, the "printer" port may be used for modem applications and the "modem" port may be used for printing applications. It all depends on which port you tell your printer or modem software to use. QuadraLink allows me to configure any one of the six serial ports as a modem port and another as a printer port. In effect, QuadraLink now acts as a software-controlled switch.

Let me illustrate what is going on by describing how I used QuadraLink to solve my printing-SAREX-TCP/IP dilemma.

My printer remained connected to the Mac's built-in "printer" serial port and the TNC I used for TCP/IP remained connected to the Mac's built-in "modem" serial port. I connected the TNC that I planned to use to monitor SAREX to the first QuadraLink serial port, then I used the QuadraLink software to configure the QuadraLink port one as the "printer port" (by doing so, I disabled the Mac's built-in printer port). Next, I configured the communications software (White Knight) that I intended to use to monitor SAREX to use the "printer" port.

Under MultiFinder, I started up the TCP/IP software and White Knight. The TCP/IP software did its thing via the Mac's built-in modem port, while White Knight listened for SAREX via QuadraLink port one. When I needed to print something, I used the QuadraLink software to disable QuadraLink port one, which in effect re-enabled the Mac's built-in printer serial port, printed my next best seller, then reconfigured QuadraLink port one so that it could be used to monitor SAREX again. Sure beats disconnecting and reconnecting cables!

Once System 7 is available and installed, life will be even easier. Connect six peripherals to the six serial ports and let 'em go . . . all at the same time. The only caveat is that the software I use with the serial ports must take advantage of the new Comm Toolbox that will be available with System 7.

The Results

By the way, twice I successfully copied the SAREX packet radio station during the first two days of the mission. Working the station was another matter. Wait 'til next time!

(QuadraLink is produced by Applied Engineering, P.O. Box 5100, Carrollton, TX 75011, telephone 214-241-6060. It sells for $299.) ❑

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Product Review

The Realistic DX-440/Sangean ATS-803A Portable Shortwave Receiver

Review by: Jonathan L. Mayo KR3T

As I was glancing through the September/ October 1990 issue of Digital Digest, I came across Dave Reynolds' review of the Sony ICF-SW7600 portable shortwave receiver. Reading his review rekindled my interest in purchasing a portable shortwave receiver. Like most active amateurs, I have a general coverage HF transceiver, so I have never been in any particular hurry to buy a portable receiver. However, I was attracted by the idea of having a receiver that I could easily take with me during my travels - particularly with all the military activity taking place in and around Saudi Arabia.

Soon after reading the review, I visited a local home electronics store to try out the SW7600. The SW7600 was everything Dave reported in his review. While there, I also looked at the ICF-SW1, the ICF-7700, and the ICF-PRO 80. I looked the radios over and tuned in a few stations. After collecting some literature, I returned home to contemplate the choices.

The next day I received a Radio Shack sale flyer in the mail. Looking through it, I was excited to see that their top of the line portable shortwave receiver, the DX-440, was on sale for $149.95 (from $199.95), about half the price of the SW7600. The DX-440 seemed to have all of the features I was looking for in a portable shortwave receiver: digital display, full coverage, and sideband capability.

I decided to purchase the DX-440 and give it a try. I planned to return it if I wasn't satisfied, but two months later I'm still glad I bought it. The Realistic DX-440 is a competent portable shortwave receiver. By no means is it the equivalent of a desktop receiver, and I probably wouldn't purchase it as my only shortwave receiver. But, it is ideal as a secondary receiver for use away from home.

Sangean ATS-803A

The Realistic DX-440 appears to be a copy of Sangean's ATS-803A portable shortwave receiver custom manufactured for Radio Shack. The list price of the Sangean ATS-803A is $259.95, compared with $199.95 for the DX-440. However, the ATS-803A can frequently be found discounted to around $190. The only difference between the two units is the inclusion of a separate audio output for use with a tape recorder on the Sangean ATS-803A. The Sangean ATS-803S also includes an AC adaptor and stereo headset which are not included with the Radio Shack version. Other than these small differences, the Sangean ATS-803A and DX-440 are identical, so my comments in this review should be applicable to the ATS-803A also.

Controls

Jacks and controls are located five of the receiver's six sides. The radio can sit upright or be tilted back, resting on a swing-out metal stand located on the back panel. Power is provided by internal batteries or an external AC adaptor.

The front panel houses the built-in speaker, digital display, and main controls. The speaker takes up a little over a third of the front panel space on the left side. The digital display is a large LCD that displays the time, frequency, or timer information. To the immediate left of the display is a five level LED signal strength indicator, and to the right are the power on and FM stereo LED indicators.

Beneath the digital display is the 11 key numeric keypad (digits 0 through 9 and an execute key). Also located near the keypad are the band selection keys (FM, AM, LW, MW, and SW), the memory control keys (Mode, Store, Scan, and Recall), and the Up and Down tuning keys.

On the right side are the remaining front panel controls: the Power button, slider controls for volume, balance, treble, and bass, the BFO Pitch and RF Gain dials, a switch that selects either FM Mono/Stereo or Wide/Narrow for AM, the BFO selector switch, and the Lock switch. FM stereo is available only through the external speaker/headphone jack, as there is only one internal speaker.

A tuning dial is located on the right side panel. On the left side panel are the AC adaptor connector and external speaker socket (on the Sangean ATS-803A, the external tape recorder audio socket is located here too). The top panel contains three control keys (Light, Timer, and Sleep) as well as the radio's telescoping antenna. The external antenna connector and the external/internal antenna switch are located on the back panel.

(cont'd on page 30)

(cont'd from page 29)

Operation

Using the DX-440 is fairly straightforward; in this section I'll discuss some of the specifics unique to the DX-440. Before I begin, however, I'd like to mention the importance of the Lock switch - especially when travelling. As I mentioned earlier, the Power button is located on the front panel. If the DX-440 were packed in a suitcase or briefcase, it would be very easy for the radio to be inadvertently turned on by having the Power button depressed. Flipping the Lock switch on disables all controls - with the exception of the Light switch. Without the Lock switch, I'd probably have to remove the batteries before packing the radio in my suitcase.

Once the receiver is turned on, the desired band is selected using keys on the front panel. Pressing the FM key will tune to somewhere from 87.5 MHz to 108 MHz. (If you press another band key and return to FM, the DX-440 remembers the frequency you were tuned to when you left - as with all band keys.) The AM key puts the radio somewhere between 150 KHz and 29,999 KHz. The MW key selects the AM commercial broadcast band from 520 KHz to 1620 KHz. The SW key is used to select between 12 frequency bands.

Once you have selected the appropriate band, the receiver can be tuned two ways. Pressing the Up/Down keys or turning the tuning dial will change the frequency. Pressing either tuning button once, or turning the dial slowly, will adjust the frequency by 1 KHz (or 0.05 MHz in the FM band). Holding a tuning button down, or turning the dial slightly faster, will tune in 10 KHz (or 0.5 MHz in the FM band) increments. Spinning the tuning knob quickly will change the frequency in steps of 100 KHz.

The desired frequency can also be directly entered using the numeric keypad. Once you've punched in the desired frequency, press the Execute key. The DX-440 will jump directly to the entered frequency. You can also store a frequency in any of the nine available memories to be instantly recalled later. To receive CW or SSB, switch in the BFO and use the BFO Pitch dial to fine tune the reception.

Once the built-in clock is set, you can program the DX-440 to come on automatically at a certain time using the Timer button. Additionally, the DX-440 can be set to turn off automatically after an interval of time, from 90 minutes to 10 minutes, using the Sleep button.

I've used the DX-440 for both voice and data monitoring. I've been able to tune in most common foreign broadcast stations successfully, as well as a few more obscure ones. I've also been able to monitor some Desert Storm stations - all using the built-in telescoping antenna. While I'm usually not usually very fond of the telescoping antenna included with most portable receivers, the DX-440's seems to work quite well. I've heard reports of other DX-440 owners successfully using a variety of external antennas with the external antenna connector. I recently purchased a portable active antenna from Heathkit for use with this radio. I haven't built it yet, but when I do, I'll let you know how it works - either in a separate review or as part of one of my regular columns here in Digital Digest.

Tuning in amateur radio stations is no problem. The BFO works fine, and I can easily tune in most all SSB QSOs that the radio picks up. The audio quality doesn't seem to be up to that of a desktop receiver but is more than adequate for a portable. In addition to SSB voice, I was particularly anxious to see how the DX-440 would do pulling in digital transmissions.

I'm pleased to report that the DX-440 does a very admirable job generating audio for my Kantronics KAM. I've been able to copy RTTY at various speeds, AMTOR, and packet with no problem. I'll mention here that the DX-440's receiver is very stable - I've left the radio tuned to the HF packet BBSs on 14,107 MHz for many hours without any difficulty. One problem with the DX-440 is the lack of a second audio output, so I use a splitter I picked up at Radio Shack to drive a pair of headphones and the audio cable running to the KAM. The DX-440, KAM, and my Toshiba T-1000SE portable PC make an excellent portable HF monitoring station. Throw in a 2 meter HT and you've got as complete a portable digital communications station as you're likely to get without hauling around a transceiver - all easily battery operated.

Conclusion

As you can probably tell, I like the DX-440 very much. While I didn't compare it side by side with the SW7600, I feel the DX-440 compares well - and at about half the price. The DX-440 is not perfect though. I'd like to see a smaller case and more memories. I also wish the controls were organized better, and a control for adjusting the LCD display for different viewing angles would be a nice addition.

I've heard from some Radio Shack managers that the DX-440 is being phased out (although it's in the 1991 catalog), but they all said they could special order one if they ran out of stock. And if you can't find a DX-440 at a Radio Shack, you could get the Sangean ATS-803A from a variety of sources, including Universal Radio (800-431-3939 or 614-866-4267). I've heard good things about Universal, and if you're at all interested in SWLing, request a copy of their catalog.

I'd be interested in hearing comments from other DX-440/ATS-803A owners - particularly regarding receiving digital communications. As always, if you have any comments, questions, or suggestions, contact me on CompuServe (72276,2276) or Prodigy (SCSD46C). ❑

Realistic DX-440 Specifications

Semiconductors:
- 01 LSI
- 07 ICs
- 08 FET
- 44 Transistors
- 59 Diodes
- 07 LEDs

Circuit:

FM	Superheterodyne
AM	Dual conversion superheterodyne

Frequency Range:

FM:	87.5 MHz - 108 MHz
AM:	150 KHz - 29,999 KHz
LW:	150 KHz - 281 KHz
MW:	520 KHz - 1,620 KHz
SW	2,300 KHz - 2,500 KHz
	3,200 KHz - 3,400 KHz
	3,900 KHz - 4,000 KHz
	4,750 KHz - 5,060 KHz
	5,800 KHz - 6,200 KHz
	7,100 KHz - 7,500 KHz
	9,500 KHz - 9,900 KHz
	11,650 KHz - 12,050 KHz
	15,100 KHz - 15,600 KHz
	17,550 KHz - 17,900 KHz
	21,450 KHz - 21,850 KHz
	25,600 KHz - 26,100 KHz

Antennas:

LW/MW	Built-in Ferrite Bar
SW/FM	Telescopic (or external)

Power:

Battery:	2 AA, 6 D
AC:	9Vdc @ 400 mA

Dimensions:
292mm x 160mm x 60mm

Weight:
Approx. 4 lbs

Sensitivity:

AM:	150 KHz 1,260 uV/m
	600 KHz 320 uV/m
	7.1 MHz 4 uV
	(20 db S/N ratio)

SSB:	150 KHz	100 uV/m	
	600 KHz	25 uV/m	
	7.1 MHz	0.4 uV	
	(10 db S/N ratio)		
FM:	87.5-108 MHz		4 uV
Image Rejection Ratio:			
AM/SSB:	150 KHz	48 db	
	600 KHz	65 db	
	7.1 MHz	60 db	
FM:	87.5-108 MHz		40 db
Selectivity:			
AM/SSB			-6db
-50db			
		Wide	+ / - 3
KHz	+/-7 KHz		
		Narrow	+ / - 2
KHz	+/-4 KHz		
IF AM/SSB/CW	1st		55.845
MHz			
	2nd		4 5 0
KHz			
IF FM	10.7 MHz		
Frequency Stability:			
1KHz per hour after 1 hour warm up.			

The first day on mobile CW...

The heat is sweltering. You're stuck in traffic with the highest speeds being slow and stop. What can you do while you wait for the next surge and merge?

Or you're on a cross country trip. You're tired of looking at the corn fields, the gravel, the pavement, the exit signs and the beer bottles. But what else can you do?

You could be talking to the world on mobile CW! So I thought soon after I got my Novice Class license. A few late nights after getting on the air, I worked two very good mobile CW operators: John, WG9K/M, and Jim, K7YLM/M, back to back. My initial reaction to these contacts was disbelief followed by curiosity. These two QSOs started me thinking about the virtues of mobile CW.

If those guys can copy and send while driving, I reasoned, why can't I? It wasn't long before I resolved to give it a try too. ONe problem haunted me, however: how can someone copy CW without paper and pencil? In order to make good on my resolve, I set about practicing to copy without them. It took several days before I felt ready to venture out on the road.

Another step which proved to be a real confidence builder was to see a mobile setup. Ralph, W6WET, a veteran mobile CW operator, provided the opportunity at just the right time. He showed me the details of his antenna mounting, feedlines, power cables - the works.

The final preparation step involved selecting and securing the right equipment for my subcompact car. I decided on using a built-in electronic keyer and paddle instead of a straight key because of the uneven road surfaces. Also, I selected a center loaded folding whip antenna so that I could drive my car into my garage at night and into parking garages during the day. I installed the transceiver so that it could be unhooked quickly; I could carry it with me so it wouldn't get stolen.

Time for the big test When the installation of my setup was complete, the obvious nest step was to test it. Now the feelings had shifted from disbelief and curiosity to terror mixed with excitement. Now was the time to "put up or shut up," I thought, so I plugged in the microphone and called CQ. This was not exactly my original plan, but it was a good start. All this was accomplished from the safety of the driveway. I knew the next morning would be the real test when the microphone would be laid to rest in the glove compartment in the car - "in case of emergency," I told myself.

The keyer paddle was carefully put in its place with quiet awe. Representing the joys of operating, now it also represented the rising self doubts and anxiety of facing something totally new.

As I eased my car out of the driveway the next day, I turned on the transceiver. The time had really come. No more microphone-in-the-driveway stuff. There were other CW operators out there listening and I had to live up to the promises and my own aspirations.

That's when I realized that I was driving a 4-speed manual transmission. Why hadn't the other mobile operators warned me about this? My thoughts raced to grasp the gravity of the moment: steering, shifting, sending all at the same time. I thought that perhaps, with a little review, I could do the first two while just looking at the keyer paddle.

Driving down the street toward the freeway I sent out my first CQ. No answer. What a relief. Leaving a green traffic light, I made a left turn and suddenly realized that this could pose a further complication. It's one thing to drive straight and send code. It's quite another to turn a corner, shift gears and send code.

Waiting at a red light I thought it would be a good time to send CQ. Proud of that discovery that a red traffic light is an opportunity for the radio operator, I confidently gave my call three times.

All of a sudden, the rush of feelings which come during the very first on-the-air experience flooded back as I heard someone introducing himself from upstate. Excitement flooded the car as I prepared to confirm the communication link.

Hearing that it was my turn, I began to send the formal introduction when the traffic signal turned green. The car lurched forward as I stumbled out my call sign.

In the excitement I had forgotten to shift from first to second gear, so I pushed in the clutch pedal and finished my call sign. While the car coasted, I stammered the usual RST report. Then I realized that I still had the clutch pedal engaged and had not shifted into second gear.

Thoroughly disoriented, I shifted back into first gear to try again. The result was an embarrassing whiplash as the engine compression quickly slowed the car, followed by the accelerator engaging as I realized too late what had happened. I sneaked a peek in the rear view mirror and found a look of consternation on the face of an impatient driver following.

The rest of the trip that day was a real experience of what Jim, K7YLM/M had wisely predicted. "The first day the main objective is to keep from hitting something," he had warned. How true.

I thought about putting a "Student Driver" sign in the back window for a few days. I wondered what it would be like to be pulled over for drunk driving. Would I have to use the microphone to call MAY DAY? How long does it take for the "Jaws of Life" to extract an Amateur from his crushed subcompact?

If you are contemplating giving mobile CW a try, by all means do it. Begin by preparing for that first day carefully. Be aware of the particular driving skills your own vehicle demands. Driving safely is the first responsibility.

You may wish to do your test drive on a quiet country road, an empty parking lot or a deserted street. Or, you may wish to plunge into rush-hour highway traffic and learn mobile CW operating real fast. In either case, there is no doubt that you'll find the outcomes rewarding and a whole lot of fun. ❑

By Mike Cafferky / AA6WQ
Excerpted from Worldradio Magazine

ARRL Comments On WARC-92 Inquiry...

The American Radio Relay League submitted its comments in response to the FCC's inquiry looking toward preparation for the World Administrative Radio Conference scheduled for February 3 to March 5, 1991 in Spain (WARC-92).

High frequency broadcasting...
Of particular interest is the proposed expansion of the HF broadcasting bands and its effect on the 40 and 80 meter ham bands. While the League does not necessarily endorse HF broadcasting expansion, it feels the FCC did take what appears to be a reasonable balance of the competing interests. The Commission is leaning toward relocating the 40 meter ham band down 100kHz. (7000-7200 kHz would be Amateur Exclusive; 6900-7200 kHz Amateur Primary and Land Mobile Secondary.)

"It is clear that the broadcasters want to broadcast more, and that technically they need more spectrum in order to do so. where, however, is the listener demand for additional HF broadcasting that cannot be satisfied by better quality delivery systems? The League suggests that there is none."

The League took extremely harsh exception to the comments of Stanley Leinwoll who "...praised the Amateur Services on one hand while proposing to cripple the Amateur Services by taking of significant amounts of critical HF spectrum on the other."

Leinwoll wants the 3500-3650 kHz [80 meter Amateur] segment relocated to the broadcasting service. He believes that narrower [ham] bands at 3.5 and 7 MHz can be successfully used [by amateurs] without adverse effect given "...proper planning and assignment of frequencies."

After reciting the accolades to the service, Leinwoll said "...that the uses made of the amateur bands are frivolous, and that large amounts of spectrum are allocated to the Service, the loss of portions of which will not disrupt Amateur communications." The League countered by saying the 3.5 and 7 MHz allocations "...are without a doubt the most overcrowded of the amateur allocations" and "The loss of any segment within those bands would result in the absolute inability of the Amateur Radio Service to provide reliable international emergency and disaster communications with Region 2 and worldwide."

Low Earth Orbiting Satellites...
The ARRL also addressed Low-Earth-Orbit (LEO) allocations below 1 GHz. It noted that a consensus of LEO mobile-satellite system (MSS) proponents believe that the 137-138 MHz and 148-149.9 MHz segments are appropriate allocations for such systems. Other commercial firms, however, felt that 173.4-174 MHz, 400.15-400.3 MHz, and 420-421 MHz was more appropriate.

Only the 420-421 MHz segment directly affects the Amateur Service. The Executive Branch is opposing this allocation as government radiolocation allocations would be adversely affected. The ARRL said that government radiolocation has proven to be a compatible sharing partner with the Amateur Service. The League opposes relocation to LEO systems "...because the 420-421 MHz band contains the vestigial sideband of an existing 420-426 MHz amateur television channel."

The League also opposed sharing the 420-421 MHz band with LEO MSS due to "...unacceptable interference to amateur stations within the large footprint of a satellite because of the high power flux densities needed to permit use of simple mobile antennas."

Broadcasting Satellite Service...
The ARRL said a general consensus supports satellite broadcasting below 2 GHz. Broadcasting from satellites is not feasible above this level because of the need for excessively high transmitter power to support the signal quality, number of channels and geographical coverage needed for a viable BSS.

The League urged the Commission to rule out the 2390-2450 MHz [ham] band for satellite broadcasting. "The Amateur Service ...requires continued access to the 2390-2450 MHz band for future (terrestrial) systems, as it is experiencing an upward migration in frequency in the same time frame as other services."

Desert Storm brings rumor QRM...

The FCC is getting scores of phone calls from nervous amateurs who want to know the details of the special Amateur Radio procedures under Operation Desert Storm. Some hams were apparently alerted by rumors or bulletins transmitted by local and national nets. The announcements seemed to state that the FCC did, or did not, order U.S. hams off the air or that it took special actions relating to amateur operation during the Gulf crisis.

"The amount of nonsense going around on this is unbelievable," one staff member commented. There are no special DEsert Storm amateur procedures. No Communications Emergency has been declared. The FCC took no amateur actions related to Desert Storm -- other than to interrupt work to answer the many phone inquiries. U.S. hams may operate as normal. They may even contact Iraqi ham stations if they can find any!

The FCC does maintain a Prohibited List of countries whose administrations have requested no intercommunication with U.S. amateurs. But the Prohibited List is entirely empty! This list is required by Article 32, Section 1 of the International Radio Regulations. There are no entries on it at this time.

Nor has there been a Presidential Finding, required by Section 706 of the Communications Act, to order the FCC to order hams off the air. Section 706(c) reads: Upon proclamation by the President that there exists war or a threat of war or a state of public peril or disaster or other national emergency, or in order to preserve the neutrality of the United States, the President may suspend or amend, for such trime as he sees fit, the rules and regulations applicable to any or any stations ..and may casue the closing of any station for radio communication ...and the removal therfrom of its apparatus and equipment, or he may authorize the use or control of any such station ...and/or its apparatus and equipment by any department of the Government under such regulations as he may prescribe, upon just compensation to the owners..."

There is a list of countries with which the U.S. has third-party amateur traffic agreements. There have been no changes to this list related to Desert Storm. Third-party traffic may be handled with Israel (4X, 4Z) and Jordan (JY).

In addition, the United States maintains Amateur Service reciprocal operating arrangements with Israel, Jordan ...and technically even Kuwait which Iraq has annexed!

Source: W5YI Report

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- **Adds frequency and associated info memory limited only by disk storage.**
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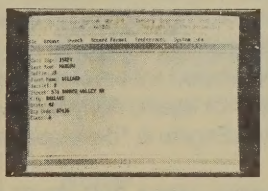

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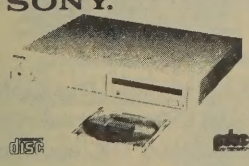

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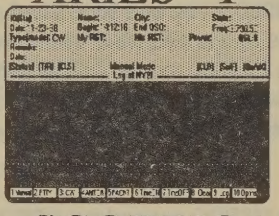

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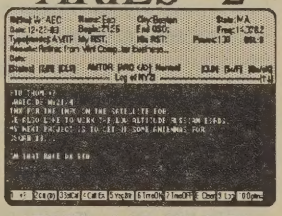

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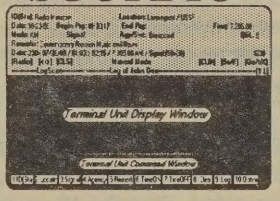

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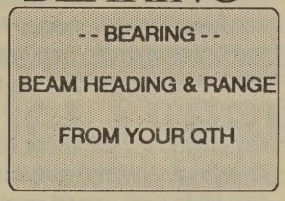

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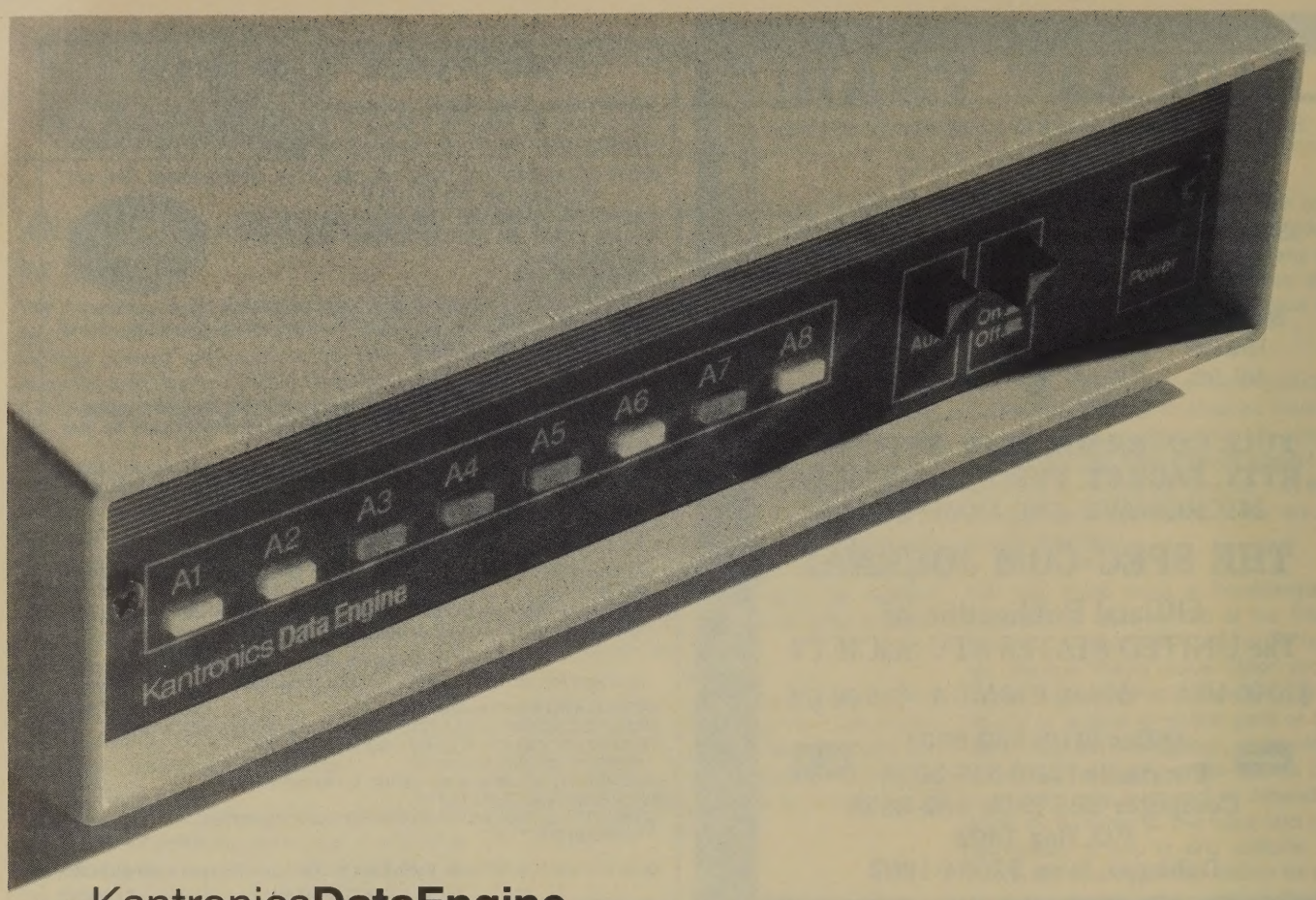

Kantronics**DataEngine**

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Better yet, you can add a free G8BPQ networking EPROM (download from our factory TELCO BBS) and run the 9600 combination as a node! Further, with the BPQ code, you can run the DataEngine in multi-drop KISS mode, attaching a KPC-2 or KPC-4 to the RS-232 port, creating a three or four port node!

Or, plug in a DE9600 or DE19200 modem and couple the DataEngine with the Kantronic's D4-10 data ready transceiver for 440 MHz high speed packet operation. (The D4-10 shall be released in early 1991).

Or, if you're interested in the DX spotting network or in transferring computer files to a buddy at 2400 baud, plug in the DE2400 modem and couple the DataEngine to any off-the-shelf transceiver. The 2400 baud QPSK modem is compatible with existing narrow band FM rigs and matches the industry standard Kantronics KPC-2400 modem.

Or, roll your own, attaching an experimental modem(s) via the disconnect headers! You might want to work satellites, play with a new form of modulation, or design your own HF modem. The disconnect headers on the DE pc board leave room for two internal or external modems. Experimenters already report interfacing the DataEngine with a PSK modem for working satellites. To aid in this fun process, you can order the DE Developer's Manual.

After all, the DataEngine is designed with an open architecture. It's a dual port, full duplex TNC with 16-bit V40 microprocessor running at 10 MHz, 85C30 communications controller, capable of speeds to 56KB per port. It comes with 64K of EPROM and 64K of RAM, and has socket space for up to .5 megabytes of EPROM and .5 megabytes of RAM!

Even better, the DataEngine comes factory stock with a DE1200 modem already plugged in and an end-user EPROM which supports terminal, KISS, HOST and BBS modes. It's ready to go on existing 1200 baud channels! The host mode enables use of sophisticated terminal programs, such as the DataEngineer, developed for the DataEngine, including windows/split screen etc. Or again, dial your own terminal program! In effect the DataEngine is "developer and user ready."

Specs: size 1-3/4"x6"x9", weight 2-1/2 lbs, power requirements nominally 12VDC at 150 ma. Input sensitivity 20 mvpp, Audio output drive jumper selectable from 10mvpp to 2vpp.

Options include: DE19200, DE9600, DE2400 and DE1200 modems, plus a developer's manual for modem and protocol experimenters. Plus more modems from Kantronics on the way!

For detailed specifications contact Kantronics. The Kantronics DataEngine, the TNC that can run fast today, and the platform to develop the next generation of advanced TNC applications.

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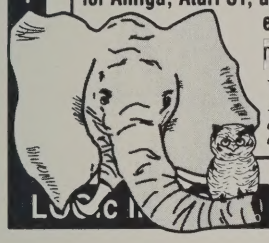

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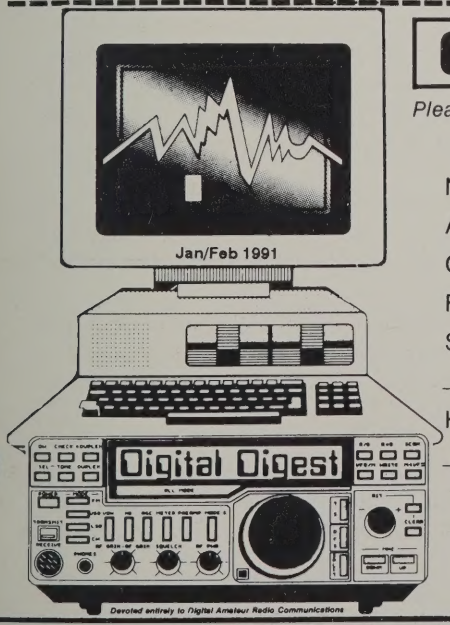

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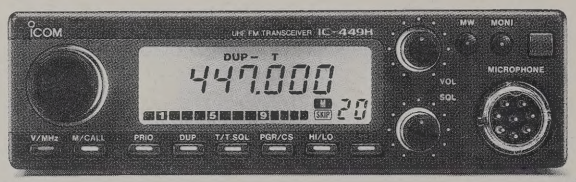

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